

INTERNAL AUDITORS' RESPONSES TO EXTERNAL AUDITORS' CRITICISMS
OF THE SYSTEM OF INTERNAL CONTROLS

BY

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Internal auditors must evaluate external auditors' recommendations for changes in the internal auditors' systems of internal controls. This study examines some of the factors that influence internal auditors in their evaluation. An experiment was performed using 125 internal auditors as subjects. Each subject was presented with four scenarios which emphasized each of four factors that were thought to influence the internal auditors' decision processes: (1) costs and benefits of the change, (2) source of the recommendation, (3) tone of the recommendation, and

(4) importance of the internal control procedure being changed.

Results indicated that the first factor was consistently the most important influence on the decision makers. Factors two, three, and four varied in relative importance depending on circumstances specified in the scenarios.

CHAPTER I INTRODUCTION

Corporate managers are responsible for safeguarding the assets and assuring the reliability of the corporation's financial statements. In all but the smallest firms, management must fulfill these responsibilities by installing and maintaining a system of internal controls.

The establishment and maintenance of a system of internal control is an important responsibility of management. The system of internal control should be under continuing supervision by management to determine that it is functioning as prescribed and is modified as appropriate for changes in conditions. [AICPA, 1982, section AU320.31]

Internal auditors play a major role in managers' efforts to maintain an effective and efficient system of internal control. In particular, internal auditors are involved in the process by which managers modify the system in response to changed conditions. This study focuses upon internal auditors' responses to recommended changes in internal control systems. Through experimentation, this study seeks to provide empirical evidence that will facilitate understanding of the process by which internal control systems are modified.

The primary purposes of this first chapter are to identify and describe the research issue and to justify its

importance as a topic for research. The first two sections, therefore, consist of a brief presentation of the research issue and of the motivations that led to the choice of the research topic. In the next section, the specific role of the internal auditor in the process of modifying internal control systems is examined. The remaining sections provide a summary of the empirical study that was designed to address the research issue. The empirical study, which used practicing internal auditors as subjects, is reported in depth throughout the remaining chapters.

The Research Issue

The internal audit staff is responsible for reviewing the system of internal control and evaluating internal and external criticisms of the system. One common source of external criticism is the external auditor's "management letter." Therefore, the focus of this study is the response of internal auditors to the types of criticisms that are often found in letters to management.

It is important to know why internal auditors respond to criticisms of their internal control systems for several reasons. These reasons can be categorized by the viewpoints of several interested parties.

Internal auditor's point of view. The internal auditor should be aware of the relative importance of various factors on his decision process. This awareness will help

him reconcile his method of approaching his job with management's expectations of him. In this sense, the factors that influence his opinion are, to some degree, a measure of his professionalism and independence.

External auditor's point of view. The external auditor is frequently the source of the criticism. It would be in his interest to have a better understanding of the impact of his communication in order to make it more effective.

Audit committee's point of view. The audit committee must motivate the internal auditors and engage the external auditor in a way designed to make the interests of the internal auditors, external auditors, audit committee, and shareholders coincide as much as possible. For this reason, the audit committee must be informed about the factors influencing the internal auditors' decisions.

Unfortunately, not much is known about how internal auditors respond to criticisms of their system of internal controls. Therefore, this study is an empirical attempt to describe the relative importance of some of the factors that influence the internal auditor's decision process.

Motivation for the Study

Three forces in the current business environment heighten the importance of research in this area. These are (1) the increasing importance of corporate audit

committees, (2) the Foreign Corrupt Practices Act (FCPA), and (3) the impact of EDP-related fraud.

Corporate audit committees. It is becoming common for the directors of large corporations to establish audit committees. The audit committee is the body ultimately responsible for the maintenance and organization of internal control. This responsibility is based in the Foreign Corrupt Practices Act (FCPA), Securities and Exchange Commission (SEC) release no. 34-15772, New York Stock Exchange (NYSE) rules, and The Statement of Auditing Standards (SAS) section 320.28 [Baruch, 1980 p. 174-5].

Among other things, the audit committee must decide issues involving changes in the system of internal controls. Furthermore, it must document those decisions. Therefore, the more important audit committees become, the more important it is to understand the method by which audit committees obtain their information and document it.

The reason an audit committee must carefully document its work is illustrated by the fact that the FCPA does not provide "definitive criteria for management to use in evaluating the adequacy of its system of internal accounting control" [Neumann, 1981, p. 79]. Yet, the audit committee is responsible for the quality of the internal control system. Therefore, the committee should document the extent of its efforts to achieve an acceptable system.

Even though the NYSE requires domestic companies traded on the exchange to have corporate audit committees, the duties of the committees have not been specified by any of the authoritative organizations involved [Baruch, 1980, p. 174]. However, there is an increased popularity, or demand, for the audit committee. Reasons given for this increased popularity of the corporate audit committee range from "heightened public awareness of corporate responsibility" to "management's desire for self-regulation" [Neumann, 1981, p. 78]. One reason for the increasing importance of corporate audit committees is suggested by Neumann: a lack of audit committee participation might be viewed by the SEC as a weakness in internal control under the FCPA.

Impact of the Foreign Corrupt Practices Act. The second force in the current business environment that increases the importance of research in this area is the impact of the FCPA. The FCPA has focused attention on internal control as a social issue. It has also redefined the responsibilities of corporate boards of directors. Even though the Act was initiated as a measure to inhibit the bribery of foreign officials, it has had a significant impact in directing accountants' attention to the importance of internal controls beyond those necessary to insure the fairness of financial statements. Thus, it provides a motivation for examining the mechanisms through which changes in internal controls occur.

EDP-related frauds. The third force in the current business environment is the increasing frequency and rising dollar amount of EDP-related fraud. This is, of course, a result of increasing reliance placed on computers by modern business. The result is due to a perverse relationship between fraud and business use of computers. Business is able to increase productivity and efficiency by using computers. At the same time, computers provide an environment in which frauds can take place faster and with larger dollar consequences than ever before.

Increased fraudulent activity [Allen, 1977, p. 52] also has an impact on the cost-benefit structure of internal control decisions because of the impact on the probability of errors. One way of measuring the dollar value of a control is to compute the conditional probability that a fraud will be prevented by a control, given the probability that the attempt at fraud will occur. Therefore, if the probability of an EDP-related fraud increases, then the benefit of a control designed to detect or prevent such a fraud also increases.

Because the increase in EDP-related fraud has a direct impact on the costs and benefits of internal control procedures used to protect the firm in an EDP-environment, the increased number and value of EDP-related frauds provides a strong motivation to study internal auditors'

responses to suggested changes in EDP-related internal controls.

The Selection of Internal Auditors as Subjects

As it becomes more common for the directors of large corporations to establish audit committees, the link between corporate responsibility for internal controls and the importance of the internal audit group becomes clearer. The audit committee is the body ultimately responsible for the maintenance and organization of internal control. Hence, the audit committee's responsibility is higher than management's responsibility because it must include control of management itself. Corporate organizations are often arranged such that professional management is directly responsible to the corporate audit committee. One of the management groups that reports directly to the audit committee is the internal audit group. The audit group advises the audit committee on matters concerning the establishment and maintenance of a system of internal control. Therefore, in the event of an external auditor's criticism, the audit committee will rely heavily on the internal audit group's recommendation [Mautz and Neumann, 1977, p. 62]. These considerations underlie this study's focus on the internal audit group's reaction to externally generated suggestions for changes in the system of internal controls.

The External Auditor's Recommendation

Organizations which depend on the protection afforded by a system of internal controls should have that system periodically reviewed. The review of a system of internal controls often leads to criticisms and related suggestions for "improvement." Those criticisms and suggestions that come from parties external to the corporate entity are the focus of the present study.

The response of a firm to external evaluation of internal control may be a function of to whom the criticism is directed, the source of the criticism, and whether or not the firm solicited the criticism. This study is concerned with solicited evaluations, coming from responsible sources and directed to the board of directors. The most important sources of such evaluations are external auditors.

The process that gives rise to an external auditor recommending an "improvement in the client's system of internal controls" is closely related to the type of engagement in which the external auditor is involved. The most common involvement between an external auditor and his client, resulting in recommended changes in internal control, is the typical audit of the client's financial statements (hereafter referred to as a standard audit). While other types of auditing engagements are possible (audit of internal control, report to regulatory agencies, audit of a special problem area), the standard audit will

serve to illustrate the relationship between the external auditor and his client's system of internal controls.

In an audit of financial statements, the external auditor predicates the amount of substantive testing on his evaluation of the client's system of internal controls and his cost-benefit analysis of various auditing techniques. The process by which the external auditor's evaluation affects the extent of substantive testing is sequential in nature. Intuitively, it would appear that the more positive the auditor's evaluation of his client's internal control, the more confidence the auditor would have in his opinion as to the soundness of the client's financial statements. This proposition is supported by Brown [1977] in presenting her financial-analyst's view of the impact of stronger internal controls on the auditor's report and the analyst's evaluation of the client. On the other hand, the authoritative pronouncements [AICPA, 1982, Section AU642.10] indicate that the external auditor's evaluation of his client's internal control system should not (theoretically) influence his level of confidence in his audit opinion, even if the auditor relied on that system in forming his opinion. This is because other audit procedures (analytical review and substantive testing) can compensate for the degree of reliance on internal controls.

It is common for external auditors to find weaknesses in the client's system of internal controls during the

course of a standard audit. In such an event, the external auditor must report such weaknesses to management or to the audit committee [AICPA, 1982, section AU323.01 amended by section AU642.62]. It also should be noted that

suggestions or other comments concerning accounting control and various other matters are often submitted to management by auditors as a result of observations made during their examinations of financial statements. These comments are often submitted by letters, memoranda, and other less formal means. This practice is encouraged. . . . [AICPA, 1982, section AU642.53]

As a result, most audits, even though they may be audits of the financial statements and not internal control audits per se, result in an "internal control letter" to management. These management letters, identifying weaknesses in the client's internal control system, are frequently accompanied by recommended changes to the system.

While the study is concerned primarily with independent external auditors' recommendations, solicited recommendations from external systems analysts have been included for comparison. Both of these sources are considered highly responsible; the major difference is that external auditors' recommendations are usually packaged with other auditing services, while a systems analyst's services are solicited for a particular purpose.

Description of the Study

The study analyzed the responses of 125 subjects (internal auditors and controllers), to external

recommendations for changes in the system of EDP-related internal controls. Subjects were asked to assume that they were internal auditors who had to make a recommendation to the audit committee as to whether the proposed change should be implemented. Forty-eight different scenarios were used. However, each subject was required to participate in only four scenarios.

The scenarios varied across four dimensions. Each of the dimensions is listed below with a brief description. A more detailed description is found in Chapter III. The dimensions (independent variables) are (1) the strength with which the external recommendation was made, (2) the source of the external recommendation, (3) the type of EDP controls in question, and (4) the type of change being recommended. The strength dimension refers to the tone of the communication. Two levels of strength were used: strong and weak. The source dimension refers to the two sources of evaluation: external auditor or systems analyst. The third dimension deals with the type of EDP controls which were the subject of the evaluation. These were three types: (1) transaction origination, (2) transaction entry, and (3) processing. The fourth dimension deals with the nature or quality of the changes recommended. The four types of criticisms are described briefly below and are detailed in Chapter III.

Controls were classified as either "complements" or "substitutes." Complement (important, necessary, needed) controls were defined as controls whose addition or deletion had a significant impact on the overall effectiveness of the internal control procedure described in the scenario. Substitute (unimportant, unnecessary, not needed) controls were defined as controls whose addition or deletion did not, in the author's opinion, change the overall effectiveness of the internal control procedure being evaluated in the scenario. The terms "complement" and "substitute" have been used previously by Fisher in 1978:

When two or more controls both contribute to reduce a cause of exposure, one needs to determine whether they are complementary, or actually increase assurance when used together, or are substitutable. [1978, p. 355]

The types of changes recommended were the addition of a control, the deletion of a control, or the replacement of one control with another. Some of the possible combinations were not used (see Chapter III). The four types of changes that were used included the following: (1) add a complement, (2) delete a complement, (3) delete a substitute, and (4) replace a substitute with a complement.

Subjects were asked to respond to seven questions about each scenario and ten questions about themselves. The seven questions about each scenario addressed the following areas: (1) evaluation of the unchanged internal control procedure, (2) importance of the internal control procedure to the

overall system of internal controls, (3) evaluation of the changed internal control procedure, (4) classification of the type of change being suggested, (5) relative importance of four factors on the subject's judgment (source of the criticism, tone of the criticism, subject's evaluation of the cost-benefits associated with making the recommended change, and other factors), (6) evaluation of the impact of the adoption of the recommendation on the quality of the overall internal control system, and (7) subject's recommendation to a hypothetical audit committee.

Organization of the Remaining Chapters

Chapter II is devoted to background information and a brief review of the literature. Chapter III describes the research methods used in this study. It includes descriptions of a general model of the problem, the experimental design, the independent and dependent variables, instrumental variables, the task and the instrument, subjects used in both pilot and field testing, the experiment, expected responses, and effects of the pilot tests. Chapter IV is a brief description of path analysis. Included are techniques for path estimation, differences in path analysis and regression analysis, and models considered in this study. Chapter V contains the experimental results and the analysis of those results. Chapter VI contains conclusions and suggestions for further research.

CHAPTER II BACKGROUND AND LITERATURE REVIEW

The previous chapter included a brief review of the interrelationship between audit committees, external auditors' recommendations relating to internal control systems, and the internal audit staff of corporations. The first section of this chapter provides background information which shows that (1) external auditors use the management letter to communicate their critical evaluations of the clients' systems of internal control; (2) audit committees consider it part of their responsibility to review these criticisms; and (3) it is a function of the internal audit group to review the changes recommended by the external auditor and advise the audit committee of their own reaction to these recommendations.

It is assumed that internal auditors evaluate internal controls primarily on a cost-benefit basis. Techniques that have been suggested for making cost-benefit analysis of internal control systems are reviewed below. An area closely related to the cost-benefit evaluation of internal controls is the substitution of internal auditing for external auditing to achieve more cost-effective external

auditing. Whether or not to include such a trade-off in a cost-benefit analysis is also addressed.

It is suggested that auditors have the ability to make expert internal control judgments. The body of literature that has grown around auditors' expert judgment ability is reviewed in the fourth section of this chapter.

Finally, the study is related to a brief review of the source credibility literature. The source credibility literature is used to justify the expectation that there will be no difference between the experimental group (source is external auditors) and the control group (source is systems analysts).

Audit Committees and the Review of Internal Control Criticisms

The question of who reviews criticisms found in a management letter is addressed from both descriptive and normative points of view: Schiff [1977] describes what is being done, while Pomeranz [1977] specifies what should be done.

At the 1977 Ross Round-Table Discussions, Schiff, Sorter, and Wiesen examined "The Evolving Role of Corporate Audit Committees" [1977]. Participants in the round table included "audit committee members, lawyers, chief financial officers, practicing certified public accountants, a representative from the SEC, and accounting professors"

[Schiff, 1977, p. 20]. One of the things to come out of the meeting was the relationship between the internal audit group and the audit committee. Basically, it was seen that internal auditors review the external auditors' criticisms with the intention of reporting their findings to the audit committee.

The June meeting is devoted to a review of internal controls and to gain assurances that shortcomings raised relative to procedures and controls in the outside auditor's management letter have been addressed correctly. [Schiff, 1977, p. 21]

The audit committee directly discusses any problems with the chief internal auditor as is evidenced by his position in the company's organizational structure: "the Chief Auditor's position has been elevated to vice-president reporting directly to the audit committee" [Schiff, 1977, p. 21]. Therefore, internal auditors, acting for audit committees, are responsible for the review of the criticism in management letters.

Pomeranz pointed out that the audit committee should be concerned with "review of management letters, specifically findings not acted upon" [1977, p. 46]. He emphasized that unadopted changes should be reviewed. Furthermore, he said that the committee should review "internal audit reports in summary form" and consider "corrective actions not taken" [1977, p. 46]. Thus, in many cases, what is done coincides with what should be done.

Cost-Benefit Analysis

There are at least four reasons why an external organization reviewing a system of internal controls might suggest a change: (1) the change is deemed to be essential; (2) the change is deemed to be a binding constraint to achieving some other goal; (3) the change is deemed to have overriding qualitative considerations; or (4) the change is deemed to be cost-beneficial. The four reasons listed are certainly not mutually exclusive, nor is the extent of the overlap known. However, each of the reasons is discussed independently.

Essential controls are those either required by law or deemed almost necessary from a practical business management standpoint. An example of a legally essential control is the requirement of the SEC Release No. 34-15722 that certain companies maintain an audit committee [Baruch, 1980 pp. 174-175]. Control over access to sensitive computer hardware and software is an example of a practical-management essential control.

Controls may become binding constraints in achieving other goals. These controls become important when the primary goal with which they are associated is considered. For example, a firm which is building a submarine has as its primary goal providing services to the government on a cost-plus basis. The government insists on a certain internal control that would be of minor importance in the normal

course of business: security over the blueprints. However, because of government security concerns, the entire opportunity to participate in the project may be contingent upon the firm's ability to show that adequate arrangements have been made for the physical security of the blueprints. Thus, physical control of the blueprints, not the ability to reproduce them, is a binding constraint to getting the contract.

Changes in controls suggested because of qualitative considerations are normative in nature. Qualitative controls are included in a system because of the belief that certain things should be protected even if they are not material. Common business practices are often qualitative controls. For example, restricting access to accounting records such as payroll ledgers is both a common business practice and a qualitative control. Controls necessitated by qualitative considerations may also be essential, constraining, or cost beneficial. DeMiotto points out that

while it is obvious that management would not want to spend more for a control procedure than the benefit to be derived from achieving a particular control objective, it is important to remember that cost considerations do not only encompass direct monetary effects. They include qualitative effects as well. [1980, p.18]

This study is not designed to examine qualitative, essential, or constraining controls; however, the controls that are studied may also be so classified. The main thrust of this study is to examine internal auditors' reactions to

external auditors' recommendations for control changes from a cost-benefit standpoint only.

Cost-beneficial controls are controls for which the benefits can be shown to outweigh the costs for a specific entity. Both costs and benefits can be classified as tangible or intangible, current or future, and probabilistic or deterministic. Furthermore, a firm is a coalition of interests to which the interests of the external authority are added in this study. This adds to the complication by making it necessary to interpret costs and benefits in relation to whom they affect in order to understand a particular decision.

Tangible costs are easily identified and enumerated. An example of a clearly identified tangible cost is the cost of providing computer equipment. Typically, intangible costs and benefits are difficult to identify or evaluate. For example, the added strain on employees when a procedure is changed is an intangible cost.

Current costs are costs to be incurred in the immediate future. For example, the payroll cost of an internal audit staff is a current cost. Future costs will be incurred far enough in the future for the time value of money to become important. An example of future costs is the payments on a lease.

Probabilistic costs are costs which are uncertain either because the amount is uncertain or because the

timing of the expenditure is uncertain. For example, the cost of business missed due to down-time on a computer is a probabilistic cost. Deterministic costs are certain in either amount or timing.

Most costs and benefits are a mixture of future or current, tangible or intangible, and deterministic or probabilistic. It is relatively easy to assess costs that are current or future, tangible, and deterministic. Where the time value of money is known fairly accurately and inflation is under control, a comparison between cost and benefits can easily be made using present value techniques. However, when future costs become probabilistic it becomes difficult to even estimate the expected present value of future costs and benefits. When costs and benefits are also intangible as well as future and probabilistic, a comparison becomes more of an art form than a science.

Auditors' Cost-Benefit Techniques

Fisher [1978] recognized the ambiguity involved in trying to detail the cost of implementing an internal control:

The cost of a control can be calculated in various ways: absolute total cost to implement a control; marginal or incremental cost; or the percentage of total or marginal cost allocated to each cause of an exposure reduced by a specific control. When two or more controls both contribute to reduce a cause of exposure, one needs to determine whether they are complementary, or actually increase assurance when used together, or are substitutable. [Fisher, 1978, p. 355]

She argued that the benefit of a control can be calculated as the product of the exposure, a percentage of the particular cause that the control is designed to prevent, and the effectiveness of the control measured as a percentage [1978, p. 355].

Rittenberg and Miner [1979] have built a cost-benefit model of internal controls using the following parameters: control objectives, number of transactions processed during a period of time, loss associated with an error per transaction, probability of an error in an uncontrolled environment, reliability of controls in reducing either the probability of a loss or the probability of an error, cost of controls, and nature of controls. The last element in the list, the nature of controls, refers to whether the controls are sequential (roughly, the only control for an exposure) or parallel (roughly, a redundant or compensating control). There are strong similarities between the complement/substitute and sequential/parallel concepts.

The authors measure exposure in two ways: (1) as the product of the loss, the number of transactions, and the probability of an error; and (2) as the product of the loss, number of transactions, probability of an error, and one minus the reliability of the control. They also illustrate how parallel controls can be combined to reduce exposure. The authors' measure of the benefit of a control is the difference in the two measures of exposure. They compare

this measure of benefit with the cost to get the net benefit of the control(s).

Cushing [1974] applied modeling concepts taken from the field of reliability engineering to the cost-benefit analysis of internal control procedures and systems. He developed a series of models of increasing complexity. Cushing's basic model revolved around a concept of reliability for internal control. Reliability was used as a measure of the probability that some accounting process, which was being controlled, would be completed without error. That was not to say that an error would not occur; rather, once completed, the process would be error-free. Process reliability is not the same as sampling reliability in auditing. Cushing computed reliability as the sum of the following probabilities:

(1) the probability that the process is executed correctly and the control step does not signal an error; (2) the probability that the process is executed correctly, the control step signals an error, and the failure of the control is detected and no correction is made; and (3) the probability that an error in the process is made, but that the control step signals an error and the proper correction is made. [1974, p. 26]

Cushing also illustrated a procedure to compute the probability of a failure to complete the process correctly. Based on these formulations, Cushing showed that the benefit of a control is the increase in the probability that the process will be correctly completed caused by the presence of the control procedure.

Cushing used the following costs in computing the total cost of an independent control associated with a single potential error:

- (1) The cost of performing the control procedure each time the process is performed.
- (2) The average cost of searching for an error and detecting whether one exists once the control procedure has signalled that one exists, and then making whatever corrections are necessary.
- (3) The average cost of an uncorrected error. [1974, p. 27]

The total cost, assuming the control step is performed, was computed as the sum of the expected costs of "(1) performance of the control step, (2) uncorrected errors, and (3) search, detection, and correction" [1974, p. 27]. The cost of not performing a control step was defined as the probability of an error times the average cost of an error. Cushing argued that a cost-benefit analysis was performed when the total cost was compared to the cost of not performing the control step.

The work reviewed above illustrates how cost-benefit analysis can be operationalized. But, it also illustrates how cost-benefit analysis becomes increasingly complex as concepts are further refined. All of the authors described rules for cost-benefit analysis. They specified ways of measuring the conditions under which the benefits of a control outweighed their costs. Fisher [1978] and Rittenberg and Miner [1979] also stipulated that being cost-beneficial was not enough to insure a controls acceptance.

The company as a whole must be considered, which means allocating resources through overall capital budgeting.

Fisher [1978, p. 352] has delineated some criteria for strategies to be adopted in response to the FCPA. She stated that corporate strategy "should be systematic, defensible, and well-documented." The strategy advocated is an appeal to consider overall corporate objectives and the interaction of controls, control objectives, and control causes. The strategy also called for ranking of controls, in a cost-benefit sense, along with other corporate projects. In other words, if all corporate projects whose benefits exceed their costs cannot be accepted, then internal controls should not be an exception.

Costs and Benefits Accruing to Individuals and Groups

Each measure of cost-benefit is contingent on a particular point of view. There are numerous points of view in the modern firm: they include management, owners, creditors, labor, governmental organizations, and external authorities.

Management's point of view. Management has a complex problem in analyzing the cost and benefits of a decision. The complexity arises because management benefits from corporate success both directly in terms of measures of job performance, and indirectly in terms of profit-sharing and future mobility. Management's decision process is

further complicated by differences in long-term and short-run notions of optimal policies.

Owner's point of view. The owner's point of view is to maximize the present value of dividends and/or stock prices in the long run (and an indirect interest in minimizing payments to all other parties), constrained by the owner's need to maintain appropriate coalitions in the long run.

Creditors' point of view. Rather than maximizing return on investment, creditors' interests lie in meeting a certain level of achievement while minimizing risk.

Labor's point of view. The classical approach is to view labor and owners in a zero sum game with the profits of the firm as the objective. However, labor takes a short-run approach to the definition of the firm's profits (as is to be expected from individuals whose investment is a day's labor and who may work elsewhere if the firm cannot pay labor's wage). This short-run approach does not include growth or escalating replacement cost of plant and equipment.

Others' point of view. Government and others have many diverse interests in the firm. Most, like labor's, are short-run. For example, governments are frequently accused of taking the expedient route of correcting social ills in the short run at the long-run expense of business.

Auditors' point of view. External auditors have an interest that partially coincides with the mutual interests

of owners, creditors, and managers, yet partially conflicts with that joint interest. The mutuality of interest comes in reducing the cost of the audit by having the client's internal audit staff do as much of the audit as possible (internal audit procedures and staff are assumed to cost the client less than external audit procedures and staff), and by having the client's system of internal controls be as effective as possible. The diversity in interest arises when (1) the cost of the marginally effective control is considered too great by the client but not so by the external auditor, or (2) the cost savings from the internal auditors' work is expected to be shared by the external audit firm and the client.

Additional non-monetary interests are also of considerable importance. An example is management's expectation that the external auditor will find weaknesses when he reviews the internal control system and will report these in the management letter. The auditor, on the other hand, feels the need to meet management's expectations and attempts to enumerate weaknesses even if they are not significant.

Study's point of view. Clearly, the issue of to whom the cost and benefits of a change in the system attach must be resolved before any predictions can be made concerning the directions that the internal audit group will take in response to criticism. For purposes of this study, the

mutuality of interests among the management, owners, and creditors will be considered the firm's interest. In effect, the study adopts the owner's point of view, adapted so as to minimize conflicting interest with other interested parties. This is achieved by selecting and wording scenarios which are as unambiguous as possible.

External Auditors' Reliance on Internal Auditors' Work

The Round-Table reported that, based on the audit committee's final evaluation of internal control, internal audit group, and external auditors, the audit committees were seen as shifting auditing tasks between internal and external auditors.

Internal controls determine the trade-offs between risks and costs, judgments that must be made by the audit committee, independent of the outside auditor. The review of internal controls could lead to changes in the scope and focus of audits. Then the determination must be made whether these modifications are to be assigned to inside or outside auditors. [Schiff, 1977, p. 26]

Ward and Robertson [1980] surveyed internal and external auditors. The results indicated that all independent auditors relied on internal auditors to some extent, but only half of the respondents claimed that they relied on internal auditors as much as possible. This was despite the fact that it was suggested that the audit costs could be decreased or the rate of increase in audit costs could be slowed through cooperative audit performance

between the internal and external auditors. Both independent and internal auditors agreed that the extent of the external auditors' reliance on the internal auditors' work should be increased.

The independent auditors' reliance took the form of two major areas: the internal auditors' contribution to internal control and the internal auditors' "performance of substantive audit procedures under the supervision of and review by independent auditors" [Ward and Robertson, 1980, p. 64]. The extent of the efficiency of the cost-savings depends on (1) "Capabilities of the internal auditors", and (2) "the reliance placed on their work by the independent auditors" [Ward and Robertson, 1980, p. 71]. Consistent with this evaluation of cost-savings, "two international accounting firms are actively promoting professional training programs for internal auditors" [Ward and Robertson, 1980, p. 71]. Therefore, it is clear that some professionals consider a shift from external to internal auditing as cost-beneficial from both the CPAs' and the clients' points-of-view.

Clay and Haskin [1981] provide a familiar economic argument in favor of greater reliance by external auditors on the work of internal auditors:

If procedures performed by an internal audit staff are duplicated during the year or at the year-end by the external auditors, the company incurs multiple costs for essentially the same information. [Clay and Haskin, 1981, p. 63]

Clay and Haskin also surveyed 100 internal auditors (60% response rate) to gather information about the competence, objectivity, value, extent of external auditor reliance, and cost effectiveness of internal auditors. Clay and Haskin found no evidence to support the idea that internal auditors were cost-effective in reducing external auditing costs. This is contradictory to what Schiff [1977] reported. Therefore, it is uncertain whether or not benefits from reduced external auditing costs should be considered in evaluating a change in internal control.

Auditors' Abilities to Make Internal Control Judgments

Ashton [1974a] measured judgment stability (within subject consistency) and judgment consensus (between subject consistency) for 63 subjects in an experimental setting. The experiment consisted of asking the subjects to evaluate an internal control setting by rating the control on a six-point scale. Intra-subject consistency over time was found to be quite high. Subject consensus was measured by the correlation among subject responses for the same experimental internal control variable settings. Consensus was also found to be quite high. These results were confirmed by Ashton [1974b], Ashton and Brown [1980], and Ashton and Kramer [1980].

Joyce [1976] was not directly concerned with auditors making internal control judgments, but was concerned with auditors' abilities to make judgments. Furthermore, Joyce's study was a response to Ashton's study which used auditors' abilities to evaluate internal controls as a vehicle to study judgment abilities. The criterion used to measure judgment ability was consensus (agreement among judges) [p. 30]. The reasons given for the selection of consensus as a measure of judgment ability were (1) if experts are measuring the same thing, no matter what method is used, their results should approach each other; (2) if professional expertise exists among auditors, it should be exhibited by consensus [pp. 30-31]. These arguments can be considered from another point of view. Only if a right answer exists, can we expect expert judgments to converge on that answer. On the other hand, if a right answer exists only through convention or definition, then consensus only measures the similarity of training among experts. Joyce pointed out that the accounting establishment goes to pains to reduce differences among auditors [p. 31]. He reviewed a series of articles that indicated a low measure of consensus among auditors. The only exception appeared to be Ashton's 1974 study [pp. 31-4]. Joyce hypothesized that the "differences in the experimental tasks required of the subjects could account for the apparent discrepancy between Ashton's findings and those of the others" [p. 33].

Basically, this difference could be attributable to the fact that Ashton asked subjects to make narrower, more technical, judgments about the quality of internal control, while the others asked for judgments on broader areas (such as the amount of audit work that would be done under given conditions) [p. 33].

Like Ashton's subjects, Joyce's subjects had to evaluate internal controls. However, they had to make a more complex judgment. For this reason, Joyce expected less consensus among his subjects than was the case for Ashton's subjects. His results were as expected. In other words, the consensus among Joyce's subjects was consistent with the lower levels observed by researchers before Ashton.

Lewis [1980, p. 594] worked from the presumption that consensus is a measure of the validity of professional judgment. Based on that presumption and utility theory, he concluded that "auditors would have to possess homogeneous utilities for the outcomes or consequences of their decisions" [1980, p. 594]. Like Joyce, Lewis pointed out some of the mechanisms that tend to create homogeneity among members of a profession, and more so among members of the same firm. He performed an experiment which was designed around the provisions of FASB Statement No. 5, Accounting for Contingencies, to test whether judgments across firms would vary more than judgments within firms. Lewis reported evidence that provided mild support for the contention that

there was less difference between firms than within firms [1980, pp. 598-9]. He also varied the materiality of the data the subjects were given. This allowed him to test whether consensus varied with materiality. He found that as materiality increased so did consensus [1980, p. 600].

It is the relationship between materiality and consensus that makes the Lewis article interesting. The direct relationship between consensus and materiality indicates that consensus is contingent on at least one event. Ashton found more consensus in simpler decision settings, while Joyce found less in a more complex setting. A major distinction between the judgment settings may be thought of as the additional contingencies encountered in the more complex setting.

This section shows that the literature offers conflicting evidence on the degree of consensus that can be expected in an experimental setting similar to this study.

The Differential Impact of Source Characteristics on the Internal Auditor's Decision

The concept of source as a variable affecting the (auditor's) confidence in a received message is well established, even codified. Auditors classify evidence by source. They consider externally generated, third-party evidence the most reliable. At the same time, auditors are taught, from their first auditing class, that internally generated documents or communications should be confirmed.

In other words, auditors are attuned to considering the source of a message separately from its content.

In this particular experimental setting, the judges are performing auditing or auditing-like functions. Therefore, the subjects should be conscious of the source-content distinction. On the other hand, the subjects' awareness of the source-content distinction does not insure that a change in source will have an impact on their decisions. This is especially true since each judge was exposed to only one source. Hence, no intra-subject comparisons were possible.

The purpose of this section is to determine if a systematic difference in response for the two sources, external auditors and systems analysts, should be expected in the current experiment. This is not to say that, if no difference in source is expected, that source itself will not be an important factor. Rather, source may still be important, but the source systems analysts had the same impact as did the source external auditors. There are two reasons to expect no difference in the responses. The first is the possibility that source could have an insignificant weight attached to it. The second is that other variables have the effect of negating the impact of source. The most important of these compensating variables is the relative confidence of the judge in his opinion compared with that of the source.

Experimental psychologists classify those attributes of a communicator which influence the receiver's attitude about a message's content as source characteristics. There is (as yet) no generally accepted measurement scale for source characteristics, theoretical constructs adopted by researchers. Therefore, each researcher has selected his own system of measurement. So, while generalizations may be made within groups studied using a set of source characteristics, no comparisons can be made between studies using different source characteristics. In particular, difficulties arise when overlapping source characteristics are used in research. For example, the characteristic of source credibility has been decomposed into expertise and bias by some researchers [Birnbaum and Stegner, 1979], while others have decomposed source credibility into expertise and trustworthiness [Haas, 1981]. The concepts of bias and trustworthiness overlap but are not the same. Other problems arise because of research methodology. Jaccard says that

persuasive messages in the experimental literature are composed of a set of belief statements (i.e. information) and hence are designed to change beliefs. When an investigator uses affect, behavioral intention, or behavior as the dependent measure, he or she is implicitly assuming that changes in these target beliefs will lead to changes in the dependent measure (an assumption that may be incorrect). [1981, p. 261]

Haas [1981] provides a useful framework for examining source characteristics. Some of the details of his

framework are useful to this discussion. For example, he describes two mechanisms by which a message could produce an attitude change. The first is called internalization. "Internalization occurs when an attitude is learned and adopted as the receiver's own by being integrated into that individual's belief and value system" [1981, p. 142]. Haas uses credibility as an example of a source characteristic that is thought to work through internalization. The second mechanism is called identification. Identification is a "desire to establish a gratifying role relationship with the source" [1981, p. 144]. Haas's example of a source characteristic that works through identification is attractiveness. In general Haas's framework has three major source characteristics: credibility, attractiveness, and power.

Source credibility is "the extent to which the source is perceived to know the 'correct' position on the issue and the extent to which he or she is motivated to communicate that position" [1981, p. 142]. Source attractiveness depends on the source being someone liked or admired. It is thought that association or emulation of someone liked or admired will improve the self-image or self-esteem of a communication-receiver. Therefore, a receiver might adopt the same attitude as a source he admires; or he might hold an attitude that supplements the attitude of the source, when the source and receiver have complementary roles

(teacher-student) [1981, p. 144]. Source attractiveness may be more influential than source credibility because source credibility could depend on the soundness of the communication, while attractiveness is independent of the logical content of the message [1981, p. 144-45].

Source credibility and attractiveness may seem independent at first, but closer examination reveals an overlap. A source may be attractive because he is credible. When an authority speaks of a subject on which he is not an authority, the tendency is to treat him as attractive because of his credibility on other subjects. Therefore, credibility and attractiveness may interact or overlap.

The third characteristic in the framework is power of the source. If the source has the ability to exercise power over the receiver, the recipient may comply with the source's communication [Haas, 1981, pp. 149-51].

In the current study, the source is either an external auditor or a systems analyst. Both have sufficient expertise to be considered credible sources, if they are perceived to have the proper motivation (trustworthy or unbiased).

Nothing definitive can be said about the attractiveness of external auditors (or systems analysts) to internal auditors. An equal number of arguments can be put forth considering whether internal auditors would find external

auditors attractive. The best of these arguments, identification through similarity, can be argued in either direction.

There is a clear distinction between the power relationship for internal-external auditors and internal auditors and systems analysts. The external auditor has a professional obligation to exercise a certain amount of power over the internal auditor. That power is derived from the terms of engagement combined with the fact that the auditor will issue an opinion. The systems analyst offers a report, but it is for internal use only. Even after the systems analyst is engaged, his power is strictly limited to internal use. Thus, it would appear that the two sources, systems analyst and external auditor, should be different on the power dimension. However, because it was felt that such use of power would obscure the other factors being examined, the external auditors' recommendations were carefully designed to avoid the naked use of power. Therefore, it is unclear if any distinction can be made between the power of the analyst and the external auditor along the power dimension.

Even if one of the source characteristics were capable of being well-measured in the experiment, another problem would make testing difficult. Jaccard found that "whenever people are more confident in themselves than the source, relatively little belief change results" [1981, p. 266].

This has significant implications for relations among "experts." By definition, an expert should be confident in his own conclusions. Therefore, it is reasonable to assume that there should be no difference between sources when the recipient is an expert, as is the case in the current experiment. Professional judgment is assumed to be strongly dependent on the circumstances of the decision. The model will represent professional judgment as various types of changes being recommended. Figure 2-1 illustrates the decision process. However, the experimenter and the subject may not agree on the classification of the type of change being recommended. Therefore, provisions have been made in the design of the experiment to measure not only the effects of the intended manipulations of the independent variables, but also the effects of manipulations with respect to the subjects' perceptions.

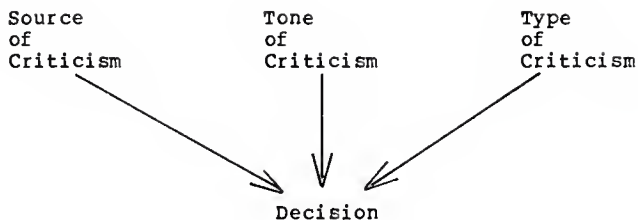


Figure 2-1. General Model of Factors Influencing Internal Auditors' Responses to External Criticism of the System of Internal Controls

This section suggests that the impact of the two sources, systems analysts and external auditors, will not be different. However, this is not to be construed to mean that source will not be a meaningful factor influencing decision.

CHAPTER III RESEARCH METHODS

The purpose of this chapter is to describe the general model of corporate behavior used as a basis for this experiment, the experimental design and task, the subjects, the hypotheses, the pilot testing procedures, and the final design.

Model of Corporate Behavior

It was indicated in the literature review that the current trend in the organization of the corporate internal control hierarchy is directed toward the use of largely independent audit committees. It was also suggested that internal control departments must frequently review suggestions for changes in the system of internal controls.

In this study, the internal auditor is used as a surrogate for the corporate audit committee. As a result, the corporate model of behavior becomes a model of the internal auditor's behavior. Because this study focuses on the response to externally generated suggestions for changes in the system of internal control, the proposed model of the internal auditor's behavior consists of the expected modes of response to that particular stimulus.

The influence of an external authority is assumed to affect the internal auditor's opinions as well as his own evaluation of the merits of the suggested change. Since no direct measures of the degree of an external authority's influence are available, the source and tone of the external authority's criticism have been adopted as surrogates. The source and tone of a message may only serve to direct attention to a problem, which will then be considered on its own merits. On the other hand, internal auditors may be more influenced by the prestige and power of external authorities. Internal auditors may respond to the influence exerted on them by external authorities in many different ways. Furthermore, the nature of their responses should be heavily influenced by their own professional judgment. In the model proposed, professional judgment is assumed to be a function of the complexity of the choice before the internal auditor. The more complex the choices available to the internal auditor, the more he will rely on his professional judgment. However, the more ambiguous the decision, the more he will rely on other factors, such as the source and tone of the criticism, to make his decision. This argument is formalized in the first hypothesis, which is presented below. All hypotheses are restated in the chapter summary.

H₁: The more ambiguous the decision, the greater the subject's reliance on the source and tone of the message.

Experimental Design

The experimental design is described in terms of scenarios, independent variables, dependent variables, other responses, and assignment of variable combinations to subjects. There were forty-eight scenarios, four independent variables, eight dependent variables and ten other responses.

Scenarios

The experimental instrument consisted of a package containing (1) two pages of instructions (see Appendix A), (2) eight to ten pages containing four scenarios (see Appendix B), and (3) two pages of additional questions (see Appendix C). The instructions contained a brief description of (1) the assumptions the subject was to make, (2) the subject's task, (3) the confidential nature of his response, (4) the absence of any time limit imposed on the task, and (5) a corporate structure. Each subject was to respond to four scenarios, each of which was based on the same corporate structure; the corporate structure was described as being common to four companies: Alpha, Beta, Gamma, and Delta. The four companies represented the four scenarios included in that subject's package.

There was a brief description of the corporate structure of the company for which the subject was assumed to work and for which the external source (external auditor or systems analyst) had suggested a change in internal controls in the scenario.

Each scenario described a different internal control procedure which was associated with a particular type of control (see the independent variable "type of control"). After the initial description subjects were asked to rate the strength of the internal control procedure and to rate the overall importance of an internal control procedure of the type described (see the descriptions of the dependent variables). The scenario then described the recommendation that was being made (see the independent variable "type of change") and the tone of the recommendation (see the independent variable "tone"). Next, the task required five more responses, numbers 3 through 7: (3) assuming the change is implemented, rate the strength of the internal control procedure; (4) classify the type of change; (5) allocate 100 points to the reasons for the subject's decision concerning the internal control change; (6) rate the impact of the change on the overall system of internal control; and (7) recommend a course of action to the audit committee. For a more complete discussion of each of the responses, see the section describing dependent variables.

The detailed scenarios are included in Appendix B. The forty-eight (3 x 4 x 2 x 2) scenarios consisted of the combinations of the various levels of the following independent variables: type of control (3 levels), type of recommended change (4 levels), source (2 levels), and tone (2 levels).

Independent Variables

There are four independent variables: (1) type of control, (2) type of change, (3) source of criticism, and (4) tone of criticism.

Type of controls. Three types of internal control areas were selected from a comprehensive survey of EDP-related internal controls performed by the Stanford Research Institute. Of the six control areas discussed, three were selected: transaction origination, (T); data processing transaction entry, (E); and computer processing, (P) [Russell, Eason, and Fitzgerald, 1977]. However, due to the nature of the scenarios, which had to be written around a particular control, the three types of controls were not varied systematically with respect to the other independent variables. In other words, while it was possible to combine an E-type of control with each of the other independent variables, it was not possible to combine the same E-type of control with each of the other independent variables. As a result the type of control variable was confounded with the scenario in which it was described. While this prevents the

study from determining anything about the three types of controls individually, it does provide a convenient way to characterize the combination of control type and scenario.

Type of change. Four types of changes were varied systematically across the other independent variables. Controls were classified by the researcher as complements or substitutes. Complement controls were designed into an internal control setting such that, if they were added or deleted, they would have a significant impact on the reliability of the system. Substitute controls were designed such that their presence or absence would not have a significant impact on the reliability of the system. The definition of substitute and complement led to the organization of the controls in a two-by-two table, shown in Figure 3-1.

	Control Added	Control Deleted
Complement	cell a	cell b
Substitute	cell c	cell d

Figure 3-1. Possible Combinations of Adding and Deleting a Substitute or Complement Control

Cell c (addition of a substitute) was eliminated from consideration because, by definition, it would have the same impact as cell d (deletion of a substitute). By contrast, cell a (addition of a complement) would enhance the

reliability of the system, while cell b (deletion of a complement) would have a worsening effect. The latter three types of changes were arbitrarily labeled: type-1 (cell a, add a complement), type-2 (cell b, delete a complement), and type-3 (cell d, delete a substitute). A fourth type of change, type-4, was included as a measure of consistency within subjects. Type-4, the replacement of a substitute with a complement, should have the same impact as adding a complement (type-1) because the deletion of a substitute should have only a small effect on internal control reliability while adding a complement is an enhancement. A review of the types of changes and their expected impact on the reliability of internal control is presented in Table 3-1.

Table 3-1. Expected Effects of Change Types on Internal Control Reliability

<u>Change Type</u>	<u>Description</u>	<u>Expected Impact on Internal Control Reliability</u>
Type-1	add a complement	increase
Type-2	delete a complement	decrease
Type-3	delete a substitute	none
Type-4	replace a substitute with a complement	increase

The researcher's classification of controls as substitutes or complements was subjected to testing in pilot test situations. Substantial revisions of the scenarios

were made as a result of these pilot tests. The details are reported in Appendix E: Pre-testing.

Each subject was asked to respond four times, once for each type of change. Subjects were randomly assigned to various combinations of types of controls and types of change as well as to combinations of the other independent variables. The details of this assignment will be presented following the description of the independent variables.

Source. The main concern of the experiment was to measure the internal auditors' responses to criticism from external auditors. However, in order to provide a standard against which to compare responses, half of the subjects were presented with recommendations from systems analysts instead of external auditors. The distinction between the sources of the recommendations was made in the instructions attached to the experimental instrument (see Appendix A: Instructions For Subjects). The subjects received one of two sets of instructions, which included a request that the subjects make some assumptions. The external auditor type of instruction read

3. The company's external auditors have recently submitted a management letter at the completion of their audit.
4. The management letter includes a recommended change in the internal control system, which has been included under the heading of "EXTERNAL AUDITOR'S RECOMMENDATION."

The systems analyst type of instruction read

3. The organizational design requires that you report directly to the board of directors' audit committee.
4. Each year the controller, who reports to the company president, employs an outside systems analyst to review the system of internal controls. The most recent analyst's report includes a recommended change in the internal control system, which has been included under the heading of "SYSTEMS ANALYST'S RECOMMENDATION."

The only other differences between the two versions of the experimental instruments were the differences in the headings. The two versions are included in Appendix B: Scenarios. A review of the literature in Chapter II indicated that no difference should be expected between the amount of reliance the subjects place on the source of the criticism for either external auditors or systems analysts. This expectation is the basis for hypothesis two, which would be desirable to support.

H2: There is no difference between the amount of reliance subjects place on the source (either external auditors or systems analysts) of the criticism.

Tone. The experiment was also concerned with the effect of the tone of the external authority's recommendation on the internal auditor's response. Therefore, two levels of tone, or strength of recommendation, were used. The measure of tone used was made relative to prior years' recommendations. For each type of change, subjects were told:

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

In total there were four levels of source and tone combinations as illustrated in Figure 3-2.

		<u>Tone Levels</u>	
		Less Critical	More Critical
<u>Source Levels</u>	External Auditor		
	Systems Analyst		

Figure 3-2. Four Combinations of Source and Tone.

Each subject was assigned four scenarios, all of which were either systems analyst scenarios or external auditor scenarios. In either case, a subject was assigned two "less" critical and two "more" critical scenarios. The four scenarios assigned to a subject were each a different type of change, and all three different types of controls were represented in each subject's package of four scenarios.

Assignment of subjects to treatments. In order to assign a reasonably small number of treatments to each subject and still be reasonably certain that the response rate would be fairly even among all cells, particular combinations of independent variables were devised. All

together there were 48 combinations of the four independent variables: type of control x type of change x source x tone = $3 \times 4 \times 2 \times 2 = 48$. It was decided that each subject could respond to four scenarios within a reasonable time (as was shown in the pilot tests).

The following additional constraints were also placed on the assignment of scenarios into four scenario packages: (1) each package must contain one each of the four types of changes; (2) each package must contain each of the three types of controls; (3) each package must contain both levels of tone; and (4) the order of the scenarios in each package must not be the same as to type of change, type of control, or tone. As a result, scenarios were combined in the six packages described in Table 3-2. There were twelve different packages in all, six for external auditors and six for systems analysts.

Table 3-2. Packages of Scenarios.

<u>Package Number</u>	<u>Type of Control</u>	<u>Type of Change</u>	<u>Tone</u>
1	T	1	s
	E	3	w
	P	4	w
	T	2	s
2	E	2	s
	T	3	w
	P	4	s
	E	1	w
3	E	2	w
	T	1	w
	P	3	s
	T	4	s
4	E	3	s
	T	2	w
	P	1	s
	E	4	w
5	T	4	w
	P	3	w
	E	1	s
	P	2	s
6	P	1	w
	E	4	s
	T	3	s
	P	2	w

Key to symbols used in table:

Type of Control

T Transaction Origination
 E Transaction Entry
 P EDP Processing

Type of Change

1 Add a Complement
 2 Delete a Complement
 3 Delete a Substitute
 4 Replace a Substitute with a Complement

Tone

s More Critical Than Last Year (Strong)
 w Less Critical Than Last Year (Weak)

Dependent Variables

Each subject was asked to make seven responses for each of the four scenarios under his consideration. Those responses are seven of the eight dependent variables: (1) internal control strength-before, (2) procedure importance, (3) internal control strength-after, (4) classification of change, (5) allocation of points, (6) impact of change, and (7) recommendation. The eighth dependent variable, difference, is the signed change in the after minus before ratings of internal control strength [(3) - (1)].

Internal control strength-before. Subjects were asked to rate the strength of the internal control procedure described in the scenario immediately after the procedure was described and before the external authority's change was presented. Their responses were recorded on a nine-point scale which ranged from very weak (-4) through adequate (0) to very strong (+4).

Procedure importance. The second question asked the subject to rate the importance of having an adequate internal control procedure designed to protect the area under consideration. The subject was to respond without reference to the particular internal control procedure mentioned in the scenario. Therefore, this question was designed to measure the importance of the weakness indicated, not the importance of a particular solution. In this way, it was possible to have a response in which a

subject stated that a control increased the strength of the particular internal control procedure, combined with a response that the overall internal control did not improve very much. The subjects responded on a five-point scale which ranged from not very important (0) to very important (+4).

Internal control strength-after. Subjects were asked to rate the strength of the internal control procedure described in the scenario immediately after the external authority's change and tone were presented. Their responses were recorded on a nine-point scale which was identical to the scale used in the internal control rating before the change.

Difference. To measure the impact of the changes presented, the difference in the before and after internal control ratings (after - before) were computed. Also, the difference was used to reclassify the responses in accordance with subjects' perceptions (rather than the author's) into three categories: (1) increased internal control, (2) decreased internal control, and (3) unchanged internal control. Table 3-3 indicates the relationship among the subjects' perceived changes and the intended (author's) manipulations of type of change.

Table 3-3. Relationship Between Expected Subject Perception and Corresponding Manipulation of Internal Control Change

<u>Difference in Internal Control Ratings</u>	<u>Corresponding Type of Internal Control Change</u>	<u>Type of Change Number</u>
increase	add a complement, or replace a substitute with a complement	1 or 4
decrease	delete a complement	2
none	delete a substitute	3

Classification of Change. Subjects were asked to classify the changes recommended to them by an external source. Rather than explain the concepts of substitute and complement in the directions, subjects were asked to classify changes as desirable or undesirable. The cover sheet instructions included the following note:

Each change involves one or two controls. Controls can be loosely classified into two groups:

- (a) **desirable** controls- those controls that correct a weakness in the internal control procedure, and
- (b) **undesirable** controls- those controls that fail to correct a weakness in the internal control procedure, including redundant controls.

You will be asked to classify each change as one of the following:

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control **and** the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control **and** the addition of a desirable control

This subject response provided an opportunity to verify the subject's internal control rating with his perception of the type of change recommended. Even if the subject classified the change incorrectly, there are a set of expectations for the dependent variable "difference." These expectations are detailed in Table 3-4. This concept suggests the third hypothesis: the change in the internal control ratings will be a function of the subject's classification of the type of change, as is specified in Table 3-4.

Table 3-4. Possible Subject Perceptions and the Corresponding Values of Difference

<u>Subject Response</u>	<u>Corresponding Type of Change</u>	<u>Corresponding Rating Difference</u>
a	1	increase
b	none	none
c	2	decrease
d	3	none
e	none	none
f	4	increase

Allocation of points. Each subject was asked to allocate one hundred points to the factors which would influence his recommendation-to-the-audit-committee decision. The subjects were given four categories for allocating their points. Three of the categories were pre-

specified: (1) source of the recommendation, (2) tone of the recommendation, and (3) the subject's assessment of the economic cost-benefit impact of the change on the company. The fourth option was to assign points to "other" factors. Subjects were reminded that the points allocated must sum to 100.

Impact of change. Subjects were asked to rate the effect that the proposed change would have on the quality of the overall system of internal controls. They were given a nine-point scale ranging from greatly reduce internal control (-4), through internal control unaffected (0), to greatly improve internal control (+4). It was thought that this response would capture the combination of the importance of the change to the particular internal control procedure and the importance of the internal control procedure itself.

Recommendation. Subjects were asked to rate the strength of their suggestions to the audit committee about the proposed change on a nine-point scale ranging from strongly recommend rejection (-4) to strongly recommend acceptance (+4).

Other Responses

Each subject was asked to provide additional data about himself after the task (completing responses to four scenarios). In all, there were ten "other" questions. The first three were intended to measure the subject's

involvement in his task. The next six "other" questions asked for demographic data about the subject. The last question related to the experimental task. The ten questions are described in Appendix D.

The Role of the Independent and Dependent Variables in the Overall Decision Model

The general decision model presented earlier as Figure 2-1 was implemented in the experimental design as a function of independent and dependent variables. The outside authority's influence on the decision process, which was implemented as the source and the tone of outside criticism, is represented by using the independent variable to obtain the independent variables source and tone. The type of criticism is represented as the independent variable type of change. The decision process is represented by two dependent variables, the importance of the internal control procedure and the internal auditor's recommendation to the audit committee. The model assumes that the internal auditor's decision is a function of the importance of the internal control procedure. The assumed decision process is illustrated in Figure 3-3.

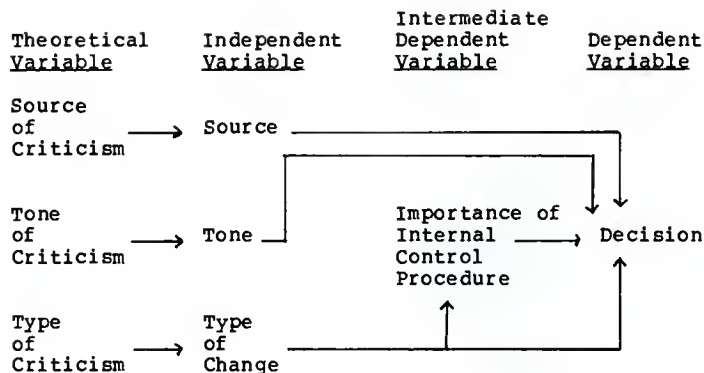


Figure 3-3. Decision Model of Factors Influencing Internal Auditor's Response to External Criticism of the System of Internal Control

The effectiveness of the decision model presented in Figure 3-3 depends on the concurrence of the experimental design and the subjects' perceptions of the design. In other words, the investigator may have intended a scenario to signal that the addition of a complement is strongly suggested by an external auditor. However, the subject may have perceived a signal that was the addition of a substitute, weakly suggested by an external auditor. This problem may be addressed in two ways. First, it could be assumed that there were no systematic differences between intended manipulations and perceived manipulations so that any errors would be averaged out by randomness. Second, the model could be redefined, based on the subjects' revealed perceptions. The second approach was adopted so that the

two alternate models (intended manipulation versus perceived manipulation) could be compared. The comparison of the models would indicate the existence of a systematic bias. Furthermore, because interest is focused on the internal auditors' reactions, rather than the ability to manipulate independent variables, the internal auditors' perceptions of the independent variable manipulations should be a preferred measure. Also, using both models simultaneously provides a measure of achieved success in the intended manipulations of the variables.

The revised decision model, which depends on the subjects' perceptions, requires the substitution of intermediate dependent variables for independent variables. The independent variables to be replaced are source, tone, and type of change. The subjects' perceptions of source and tone were taken from the dependent variable which asked the subjects to assign 100 points to the factors that influenced their decisions. The subjects' responses for strength of source were substituted for the independent variable source. However, because the source response and the tone response were not independent, the measure of tone could not be used without removing the systematic effect of source. This problem was overcome by regressing tone on source and using the residuals as a measure of tone. The model used was
$$\text{Tone} = a + b \times \text{Source} + e.$$
 The residual term, e , was used as a measure of tone.

The last independent variable to be replaced by the subjects' perceptions was type of change. The subjects' perceptions were measured by directly asking them to classify each of the scenarios they worked. These responses were used in the perception model in place of the type of change. This procedure provides a built-in measure of the subjects' involvement in and understanding of their tasks by comparing subjects' classifications of each scenario with the dependent variable "difference." A positive value for "difference" is expected to result from types of change one and four. On the other hand, a type-2 (type-3) change should result in a zero (negative) value for "difference." This was used as one test of the third hypothesis. The substitution of subjects' perceptions for intended manipulations results in a revised model, which is illustrated in Figure 3-4.

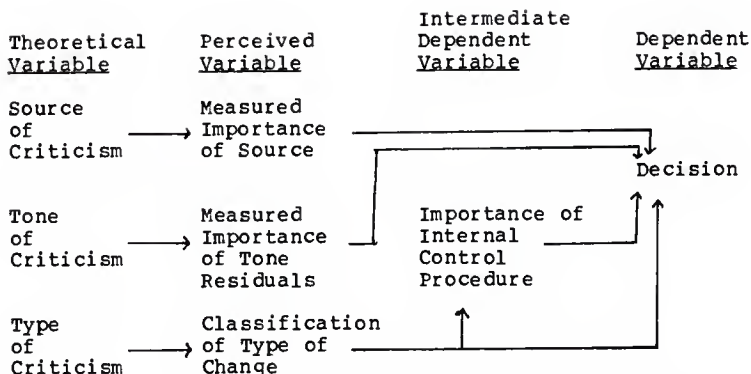


Figure 3-4. Decision Model of Perceived Factors Influencing Internal Auditors' Responses to External Criticism of the System of Internal Controls

Subjects

The final field experiment work was completed using internal auditors¹ and controllers from a variety of sources in two types of settings. In the first setting the experiment was administered at a monthly meeting of the Orlando, Florida, NAA chapter. Chapter officers asked members to participate in the experiment. However, the conditions under which the experiment was administered were

¹A variety of subjects was used in both the pilot and field testing phases of the experiment. Subjects used in early pilot tests were University of Florida undergraduate auditing and accounting Ph.D. students. The pilot was extended to the field by using a small sample of internal auditors who worked for an independent software production firm and a controller. The results led to several revisions of the experimental instrument.

not conducive to promoting subjects' concentration. Fourteen responses were completed at the meeting and another five were returned by mail. The experimenter felt that this approach to gathering data was unsuitable. Therefore, the rest of the data was gathered using a different approach. Having obtained no statistically significant difference in responses for this first group of subjects and other subjects, all were treated as a single group (Statistical tests are presented in Chapter V).

The second approach involved contacting individual presidents of NAA chapters, asking them to assist in distributing experimental packages to qualified subjects at their monthly meetings. The subjects were provided with an experimental instrument in a self-addressed stamped envelope. Each envelope had an index card attached to the outside, reminding readers that respondents should be either internal auditors or controllers. No provision was made to detect which responses came from which chapter, so only an overall response rate can be computed. In addition to NAA chapters, a few qualified individuals participated along with an IIA chapter and an EDP Auditors Association chapter. Table 3-5 provides details of the response rate. Of the 126 responses received before an arbitrary cut-off date, one was deemed useless due to its incomplete nature. Some of the other 125 responses were only partially completed. If a subject failed to complete the "other" questions, his

responses were used nevertheless. However, if a subject failed to complete a dependent-variable answer, that particular scenario was not used. There were 5 instances of partial responses to dependent-variable questions. Therefore, there were 495 completed scenarios (125 subjects x 4 scenarios per subject = 500, less 5 incomplete scenarios).

Table 3-5. Subject Pool and Response Rate

<u>Organization</u>	<u>City</u>	<u>Number of Instruments Accepted</u>
NAA	Orlando, Fl.	19 (only non-mail group)
Publix	Lakeland, Fl.	6
NAA	Houston, Tx.	50
NAA	Atlanta, Ga.	50
NAA	Wilmington, De.	100
EDP Auditors and IIA	Jacksonville, Fl.	80
Fl. State University	Tallahassee, Fl	6
NAA	Miami, Fl.	20
Eckerd Corp.	Clearwater, Fl.	8
NAA	Baton Rouge, La.	35
Total instruments distributed		374
less Orlando-NAA		19
Total instruments distributed by mail		355
Total number of responses		126
less Orlando-NAA		19
Total mail responses		107
Response Rate (107/355) 30%		

The method used to select subjects was not random, and the selection biases are unknown. Selection biases may be

attributable to differences among all internal auditors and those who are members of the pool of possible subjects that were selected. There may be differences among organizations which agreed to participate and organizations which did not participate. Within a participating group there could be differences between those who were qualified to participate and those who chose to participate. Even though a similar appeal was made to the leadership of each participating organization, there may have been differences in the leaderships' approaches to subjects themselves. It is impossible to test for most of these differences. However, it is hoped that geographic diversification and the reasonably large sample size will mitigate any effects of self-selection biases.

Chapter Summary

A description of the experimental instrument and the dependent and independent variables was detailed. This chapter also developed a simple description of corporate behavior within a very limited scope. The dependent and independent variables were related to the description, and the groundwork was laid for a statistical analysis, to be presented in the next chapter. The research design to be used in the experiment was presented along with a description of the subjects and the pretesting of the experimental instrument. Finally, three hypotheses, which

are repeated below, were included in the discussion. The results of the hypotheses are presented in Chapter V.

- H₁: The more ambiguous the decision, the greater the subject's reliance on the source and tone of the message.
- H₂: There is no difference between the amount of reliance subjects place on the source (either external auditors or systems analysts) of the criticism.
- H₃: The change in the internal control ratings will be a function of the subject's classification of the type of change, as is specified in Table 3-4.

CHAPTER IV CAUSAL MODELS AND PATH ANALYSIS

Since several variables are measured in this study and several relationships are simultaneously hypothesized, it is necessary to examine the nature of causality in the proposed model of behavior in order to strengthen the inferences that may be drawn from the results of the experiment. The analysis of causality also prompts the appropriate statistical procedures that are necessary for testing (path analysis, etc.).

Correlation among variables may be the result of cause and effect. In general, it is agreed that, in order to show causal relationship, three conditions must be satisfied: (1) the variables must be correlated; (2) the cause must precede the effect in time; and (3) alternative hypotheses must be eliminated [Abdel-khalik and Ajinkya, 1979, p. 26 and Asher, 1976, p. 11]. Therefore, to show that the model proposed in this study is a valid contender against other models, the sequence in which the variables occur and alternative hypotheses must be considered.

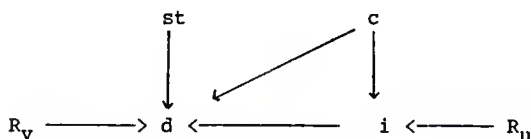
For discussion purposes, the proposed model (Figure 3-5) can be reduced to four variables by combining source and tone (because these two variables are neither considered to be independent, nor are they measured independently). For convenience, the four variables are abbreviated as shown in Table 4-1.

Table 4-1. Abbreviated Form of Variable Names

<u>Long Form</u>	<u>Abbreviated Form</u>
Measured Importance of Source	
and	st
Measured Importance of Tone (Residuals)	
Classification of Type of Change	c
Importance of Internal Control Procedure	i
Decision	d

It is convenient to represent causal relationships using an arrow diagram, as used in Asher [1976, p.13], who defines three types of variables: exogenous, endogenous, and residual. In the current model, c and st are exogenous variables (see Figure 4-1). Endogenous variables are affected by other variables; in the model, i and d are endogenous variables. Residuals are those factors, not actually measured, that impinge upon the endogenous variables.

As a result of combining source and tone into the single variable st, the model may now be presented as a four-variable causal model. The abbreviated model is presented in Figure 4-1 with the four variables arranged in a causal network.



Structural Equations

$$i = p_{ic}c + p_{iu}R_u$$

$$d = p_{dst}st + p_{dc}c + p_{di}i + p_{dv}R_v$$

Figure 4-1. Four-Variable Causal Model

Spurious effects can be illustrated using three of the variables in the model adopted in this study: c, i, and d. In the model c affects d in two ways. There is a direct effect by c on d and perhaps an intermediate effect through i. This relationship is modeled in Figure 4-2.

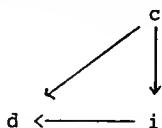


Figure 4-2. Model of the Relationship Between Change, Importance, and Decision

The role of the middle variable, i , in the model can never be known with certainty as a result of statistical tests. As Simon pointed out:

We begin with a set of observations of a pair of variables, x and y . We compute the coefficient of correlation, r_{xy} , between the variables, and whenever this coefficient is significantly different from zero we wish to know what can be concluded from the causal relation between the two variables. If we are suspicious that the observed correlation may be derived from 'spurious' causes, we introduce a third variable, z , that, we conjecture, may account for this observed correlation. We next compute the partial correlation, $r_{xy.z}$, between x and y with z 'held constant,' and compare this with the zero order correlation, r_{xy} . If $r_{xy.z}$ is close to zero, while r_{xy} is not, we conclude that either: (a) z is an intervening variable; or (b) the correlation between x and y results from the joint cause of z on both those variables, and hence the correlation is spurious. [1954, p. 468]

In other words, if the variable i is added to a model to explain the covariation between c and d , one cannot use statistical methods to distinguish between $c \rightarrow i \rightarrow d$ and $c \leftarrow i \rightarrow d$. However, the knowledge of the sequence of the events and common logic should indicate that the perceived importance of an internal control procedure did not cause an external auditor to propose a particular type of change (especially deletion of a complement or addition of a substitute). Therefore, it can be safely concluded that c affects d indirectly through i , $c \rightarrow i \rightarrow d$, provided that $r_{cd.i} = 0$.

Blalock applied Simon's work to all possible four-variable models [1962]. For each of the non-trivial four-variable models, Blalock offered a test of fit. Basically the test indicates which specific correlations among the four variables needs to be zero in order not to be able to reject a particular model as appropriate. He did not provide a test of which model fit "best." However, Blalock's procedure, which allows us to reject a model, provided considerable insight into the modeling process. Figure 4-1 is similar to Blalock's model A1 which is reproduced below in Figure 4-3.

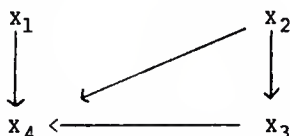


Figure 4-3. Blalock's Model A1

It is convenient to show that Blalock's model A1 and the model proposed in this study are analytically identical so that Blalock's analysis can be adapted to the study's model. Blalock restricted his models to the simplest case, recursive models. To be recursive, the first variable in the chain, X_1 , depends only on variables outside the model. Variable X_2 , the second variable, can depend only on X_1 . This causal dependence is written: $X_1 \longrightarrow X_2$. In an analogous fashion, X_3 can depend only on X_1 or X_2 , and X_4 depends on some combination of X_1 , X_2 , and X_3 .

Of course, how X_1 , X_2 , and X_3 relate to X_4 is unknown; but if the variables are modeled in a particular fashion, that model can be eliminated because each model predicts certain vanishing correlations. Therefore, Blalock's technique provided a practical method to support a hypothesis indirectly by specifying which other hypotheses could be rejected. The method does not insure the rejection of all incorrectly specified hypotheses. If the absence of a link is hypothesized, a false hypothesis can be rejected based on the presence of a non-vanishing correlation. To apply Blalock's technique, the model's variables must be recursive (the model must proceed in time, and it can have no feedback loops).

To affect causality, the experiment was conducted such that the subjects were exposed to the independent variables corresponding to change (c) and source-tone (st) before they were asked to respond to the questions that were used as the variables i and d. Also, the i question always preceded the d question. Therefore, the timing of the variables, with the exception of the first two, followed the sequence: $X_1 \equiv c$, $X_2 \equiv st$, $X_3 \equiv i$, and $X_4 \equiv d$. It will be shown that the ambiguity of precedence between c and st is unimportant. However, cognitive dissonance theory might suggest that after the decision, earlier perceptions could be altered, forming a feedback loop. On the other hand, subjects were asked the questions in a particular order. If feedback

occurred, it would occur in another scenario. Therefore, the absence of a feedback loop will be assumed. It can easily be shown in what follows that the time ordering between \underline{c} and \underline{st} is unimportant to the model.

Notice that in Figure 4-3, X_1 and X_2 have no connecting arrow. Other than the arrow between X_1 and X_4 , Figure 4-3 is symmetrical. If we reverse the order of \underline{c} and \underline{st} so that \underline{st} corresponds to X_1 , then the model would be unchanged as long as the original X_2 was still linked to X_4 .

Ballock specified that the model can be rejected if $r_{12} \neq 0$ (link between X_1 and X_2) or if $r_{23} \neq 0$ (link between X_2 and X_3). These relationships are stated as null hypothesis 4.

H₄: $r_{12} = 0$ and $r_{23} = 0$.

Path estimates in a recursive model are found using regression. "To obtain estimates of the main path coefficients, one simply regresses each endogenous variable on those variables that directly impinge upon it" [Asher, 1976, p. 29]. Residual paths are also easily found from a regression. "Since standardized variables have a variance of one, the general expression $1-R^2$ is simply the proportion of unexplained variance. Therefore, the residual path coefficient is simply the square root of the unexplained variation in the dependent variable in question" [Asher, 1976, p. 31].

A series of assumptions are necessary in order to perform path analysis. These are based on the regression analysis assumptions. The regression assumptions about the error term are

- (1) its mean is zero;
- (2) it has a constant variance for different values of X_i (homoscedasticity);
- (3) pairs of error terms are uncorrelated; and
- (4) the independent variables and error terms in the same equation are uncorrelated. [Asher, 1976, p. 25]

For regression, it is also necessary to assume a normally distributed error term with the models being linear in the b_i 's [Asher, 1976, p. 25].

In addition to the regression assumptions, Blalock's technique requires that the model be recursive, and the independent variables are assumed to be measured without error [Asher, 1976, p. 27]. The last assumption might give concern if the path analysis were used to examine non-experimental data. However, in this experiment, the independent variables were controlled.

In this study, estimation of the following paths is of interest (refer to Figure 4-1): (1) $P_{d\ st}$ (2) P_{1c} ; (3) P_{dc} ; (4) P_{di} ; (5) P_{iRu} ; (6) P_{dRv} ; and (7) $P_{c\ st}$. The method of estimation and regression formulas used to find these p_{ij} 's is given in Table 4-2.

Table 4-2. Formulas Used to Generate Path Coefficients Used in the Model

i	j	<u>Regression Model</u>	
d	st	Model 1	
i	c	Model 2	
d	c	Model 1	
d	i	Model 1	
i	R _u	$(1-R^2)^{.5}$	where R^2 comes from the regression using R _u
d	R _v	$(1-R^2)^{.5}$	where R^2 comes from the regression using R _v
c	st	r _{c st}	

Regression Models

Model 1: $d = p_{d\ st\ st} + p_{dc\ c} + p_{di\ i} + p_{dRv\ R_v}$

Model 2: $i = p_{ic\ c} + p_{iRu\ R_u}$

The decomposition of correlation between two variables depends on the technique used to estimate the path coefficients, p_{ij} 's. The p_{ij} 's may be estimated by: (1) solving simultaneous equations (see Simon), (2) multiplying by structural variables and then solving (see Blalock), or (3) by using regression coefficients. In any event it is mathematically convenient to standardize the data before computing the p_{ij} 's. If regression coefficients are used to estimate the p_{ij} 's, the regression coefficients themselves may be standardized. In this study, standardized data was used in Ordinary Least Squares Regression to

estimate the p_{ij} 's. The correlation coefficients and partial correlation coefficients used to estimate the p_{ij} 's were not standardized.

"If the model were specified correctly", (see hypothesis 4) "then (except for measurement and sampling errors) the empirical correlation between any two variables should be numerically equal to the sum of the simple and compound paths linking the two variables" [Asher, 1976, p. 34]. A compound path is equal to the product of the simple paths comprising it. Therefore, to decompose the correlations in a model, it is necessary to identify each path between variables according to the following rules:

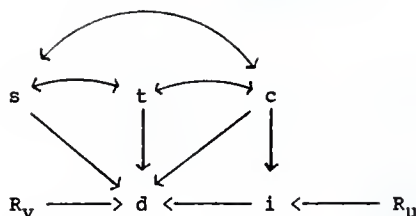
- (a) no path may pass through the same variable more than once;
- (b) no path may go backward on an arrow after the path has gone forward on a different arrow;
- (c) no path may pass through a double-headed curved arrow more than once in a single path. [Asher, 1976, p. 33]

Once the paths have been identified, the correlations can be decomposed into three categories: (1) direct effects, (2) indirect effects, (3) and non-causal effects. The direct effects are the direct paths between the two variables. The indirect effects are the compound paths which are followed without going through a double-headed curved arrow or going backward on an arrow. All paths other than direct or indirect are non-causal. The correlations and their connecting paths used in the four-variable model are given in Table 4-3.

Table 4-3. Correlation Pairs and Connecting Paths for the Four-Variable Model

Variables		Causal Paths		<u>Non-Causal Paths</u>
<u>First</u>	<u>Second</u>	<u>Direct</u>	<u>Indirect</u>	
c	st	$r_{c\ st}$	none	none
c	i	P_{ci}	none	none
d	c	P_{dc}	$P_{ic}\ P_{dc}$	$P_{c\ st}\ P_{d\ st}$
d	st	$P_{d\ st}$	none	$P_{c\ st}\ P_{dc}$ $+P_{c\ st}\ P_{ic}\ P_{di}$
d	i	P_{di}	none	$P_{ic}\ P_{dc}$ $+P_{ic}\ P_{c\ st}\ P_{d\ st}$
i	st	none	none	$P_{ic}\ P_{c\ st}$

The model proposed in this study is a five-variable model rather than the simplified four-variable model used to illustrate causal analysis. Blalock's four-variable model is an extension of Simon's and others' three-variable models. The ability to generalize the principles of earlier work to an n-variable model is specified in Simon [1971, p. 5]. The study's five-variable model is derived by separating the variables st into two variables, s and t. The five-variable model is presented in Figure 4-4.



Structural Equations

$$i = p_{ic}c + p_{iu}R_u$$

$$d = p_{ds}s + p_{dt}t + p_{dc}c + p_{di}i + p_{dv}R_v$$

Figure 4-4. Five-Variable Model

Hypothesis 4 should now be restated to fit the five-variable model. A five-variable model could have as many as $\binom{5}{2} = 10$ links. However, only eight links are included in the model. The two missing links are (1) p_{ti} and (2) p_{si} . In addition, the double-headed curved arrows indicate that the three links among the independent variables, p_{st} , p_{sc} , and p_{tc} , are to be considered exogenous to the model.

Therefore, the Blalock technique would indicate two vanishing correlations associated with paths p_{ti} and p_{si} . In other words, $r_{si.tc}$ and $r_{ti.sc}$ should be approximately zero. The two uninvolved independent variables are "held constant" to prevent a spurious correlation that might occur if r_{st} , r_{sc} , or $r_{tc} \neq 0$. Therefore, it would not be desirable to reject hypothesis 4.

$$H_4: r_{ti.sc} = 0 \text{ and } r_{si.tc} = 0$$

The computation techniques for the paths based on the five-variable model are presented in Table 4-4. Also, the decomposition of the $\binom{5}{2} = 10$ correlation combinations is given in Table 4-5. The techniques described in this chapter together with the formulas given in Tables 4-4 and 4-5 represent the method used for the analysis of data in Chapter V.

Table 4-4. Formulas Used to Generate Path Coefficients in the Five-Variable Model

i	j	<u>Regression Model</u>	
d	s	Model 1	
d	t	Model 1	
d	c	Model 1	
d	i	Model 1	
i	c	Model 2	
s	t	r_{st}	
t	c	r_{tc}	
s	c	r_{sc}	
i	R_u	$(1-R^2)^{.5}$	where R^2 comes from the regression using R_u
d	R_v	$(1-R^2)^{.5}$	where R^2 comes from the regression using R_v

Regression Models

Model 1: $d = p_{ds} s + p_{dt} t + p_{dc} c + p_{di} i + p_{dRv} R_v$

Model 2: $d = p_{ic} c + p_{iRu} R_u$

Table 4-5. Correlation Pairs and Connecting Paths for the Five-Variable Model

<u>Variable</u>		<u>Causal Paths</u>		<u>Non-Causal Paths</u>
<u>i</u>	<u>j</u>	<u>Direct</u>	<u>Indirect</u>	
d	s	P_{ds}	none	$P_{dt} P_{st} + P_{dc} P_{cs}$ + $P_{di} P_{ic} P_{cs}$
d	t	P_{dt}	none	$P_{ds} P_{st} + P_{dc} P_{ct}$ + $P_{di} P_{ic} P_{ct}$
d	c	P_{dc}	$P_{ic} P_{di}$	$P_{dt} P_{ct} + P_{ds} P_{cs}$
d	i	P_{di}	none	$P_{dc} P_{ic} + P_{dt} P_{ct} P_{ic}$ + $P_{ds} P_{cs} P_{ic}$
i	c	P_{ic}	none	none
i	t	none	none	$P_{ic} P_{ct}$
i	s	none	none	$P_{ic} P_{cs}$
c	t	none	none	r_{ct}
c	s	none	none	r_{cs}
s	t	none	none	r_{st}

CHAPTER V ANALYSIS AND RESULTS

In Chapters III and IV, four hypotheses were developed and the path analysis model was discussed. In this chapter, the path analysis is performed and the hypotheses are tested. Some background tests are done first.

The background work is organized in three sections: (1) disposition of missclassified responses, (2) intended vs perceived classification, and (3) subject reliability. The first section, disposition of misclassified responses, is devoted to determining whether or not to include in the analysis data from scenarios that were missclassified by subjects. In the second section, the effect of classifying the data as perceived rather than as intended is analyzed. "Intended" refers to the author's intended manipulation of the independent variables. "Perceived" refers to the subjects' perceptions of what the values of the independent variables were. The third section examines subject reliability by specifically including in the analysis the responses of subjects who missclassified most of their responses.

In the remainder of the chapter each of the following hypotheses is addressed.

- H₁: The more ambiguous the decision, the greater the subject's reliance on the source and tone of the message.
- H₂: There will be no difference between the amount of reliance the subjects place on the source (either external auditors or systems analysts) of the criticism.
- H₃: The change in the internal control ratings will be a function of the subject's classification of the type of change, as is specified in Table 3-4.
- H₄: The path analysis model will fit, i.e., $r_{ti.sc} = 0$ and $r_{si.tc} = 0$.

For convenience the variables may be referred to in an abbreviated form. The variables and their abbreviations are given in Table 5-1.

Table 5-1. Abbreviations for Variables

Abbreviation Variable

s	Source
t	Tone
c	Type of Change
i	Importance of Procedure Being Changed
d	Subject's Decision- Recommendation to Audit Committee
diff.	Difference- Subject's Final Evaluation of Scenario's Internal Control Minus Initial Evaluation

Type of Control

T	Transaction Origination
E	Transaction Entry
P	EDP Processing

Disposition of Missclassified Responses

Whenever a subject answered question four (classify the type of change being recommended) differently from the expected response, his response was labeled missclassified. Table 5-2 provides a breakdown of the percentage of responses which were missclassified by type of change and type of EDP-control task. There were four types of changes (add a complement, delete a complement, delete a substitute, and replace a substitute with a complement) and three types of EDP-controls (transaction origination, transaction entry, and EDP processing).

Table 5-2. Table of Missclassified Responses as a Percentage of All Responses

		<u>Type of Change</u>				Total
		1	2	3	4	
Type of EDP control	En	10%	26%	35%	47%	30%
	Pr	18%	77%	79%	51%	56%
	Tl	13%	20%	50%	55%	35%
	Total	14%	41%	54%	51%	40%

In Table 5-2, cells P2 and P3 represent the worst missclassifications by subjects. Therefore, those two cells are selected for further examination. In cell P2, the correct answer would have been "C", delete a complement. (Refer to Table 3-4 for a complete list of expectations by type of change.) In Table 5-3, the P2 responses are sorted by answers to question four.

Table 5-3. Distribution of Subjects' Classification of Type-P2 Scenarios

<u>Perceived Type of Change</u>					
	A	B	C*	D, E, & G	Total
Frequency	8	18	10	7	43
Percent	18.60	41.86	23.26	16.29	100.00

* indicates correct response

Most of the incorrect responses were "B" or "A." A response of "B" indicated that the subject thought the change was an addition of a substitute, while response "A" indicated that the subject perceived an addition of a complement. In other words, 60.46% (18.60% + 41.86%) of the subjects missclassified this change as an addition rather than a deletion of a complement. Examination of the scenario in question (see Appendix B) shows that the recommended change involves adding to the duties of the tape librarian. The additional duties are in violation of the separation of duties concept. Therefore, the correct answer to question four should be "C", deletion of a complement. Subjects who analyzed this scenario as an addition of a control were most likely confused between the classification of adding duties and adding a control. Perhaps the 42% who answered "add an undesirable control" thought of the added duties as "adding a control" but correctly analyzed that the change would have an ill effect.

In Table 5-4, the P3 responses are sorted by answers to question four.

Table 5-4. Distribution of Subjects' Classification of Type-P3 Scenarios

	A, B, & F C		D*	E	Total
Frequency	8	17	8	6	39
Percent	20.51	43.59	20.51	15.38	100.00

* indicates correct response

Examination of scenario P3 (see Appendix B) reveals that the intended change was from maintaining six months of backup tapes to maintaining three days of backup tapes for the master and transaction files. The grandfather, father, and son (three days of tapes) are considered adequate in the literature to reconstruct the current balance and the history of the account, if you assume that the account contains a history of past transactions. Therefore, the expected answer was "D", delete a substitute. The 43.59% who responded "C", delete a complement, may have considered the additional backup tapes necessary, especially if they thought that the master file contained only the current balance. In that event, the old transaction tapes would be necessary to reconstruct the account histories. Unfortunately, the detailed nature of the master file was not included in this scenario. Furthermore, if the subject understood the change as recommending the trading-in of the

six-month policy in favor of the three-day policy, he may have responded to question four with an "E", replace a substitute with a substitute. 15.38% of the subjects responded "E."

From the analysis of some of the missclassified responses, it can be seen, after-the-fact, that subjects might have had "legitimate" reasons for missclassifying scenarios. This raises a question of whether the remaining analysis should be performed on data classified by intended manipulations or on data classified according to the subjects' perceptions.

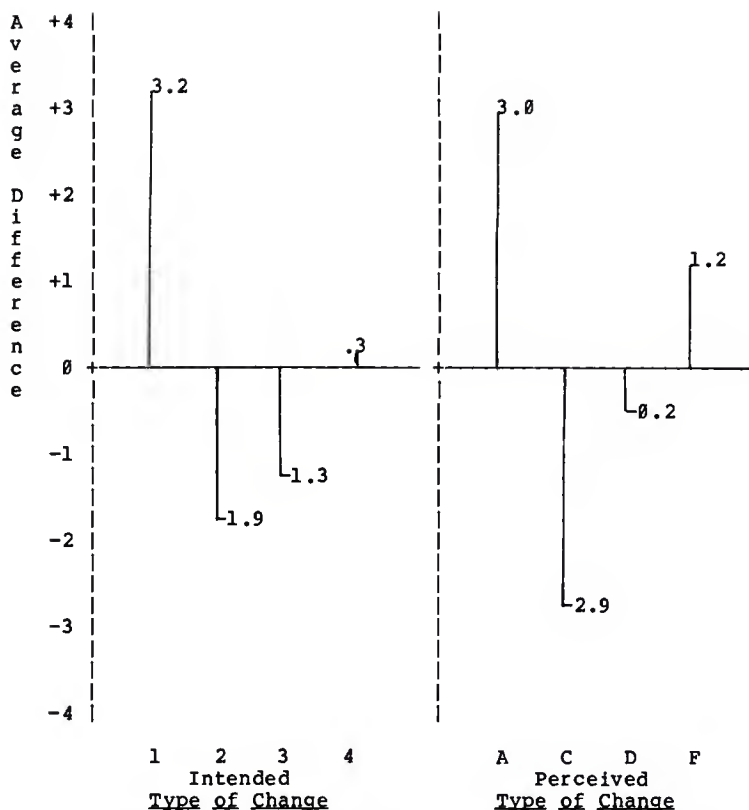
Intended vs Perceived Classification

The results were analyzed to determine if the author's intended manipulations of the variable, type of change, were correctly perceived by the subjects. This analysis was accomplished in two ways.

First, the subjects' classification of the proposed change (question four), was compared with the intended manipulation. For example, the expected response to a type-1 change, add a complement, was "A" (see table 3-4). Table 5-2 shows that 40% of all scenarios were missclassified.

Second, the subjects' responses were compared to responses that would be expected if they had correctly perceived the intended manipulation. For example, the expected value of the variable "difference" for a type-2

change, delete a complement, was a decrease or negative value (see Table 3-1). The responses for each category were classified and compared to the expectations shown in Tables 3-3 and 3-4. The results, displayed in Figures 5-1 and 5-2 and Table 5-5, show that the perceived classification results are more consistent with the expectations than are the results based on intended manipulations.

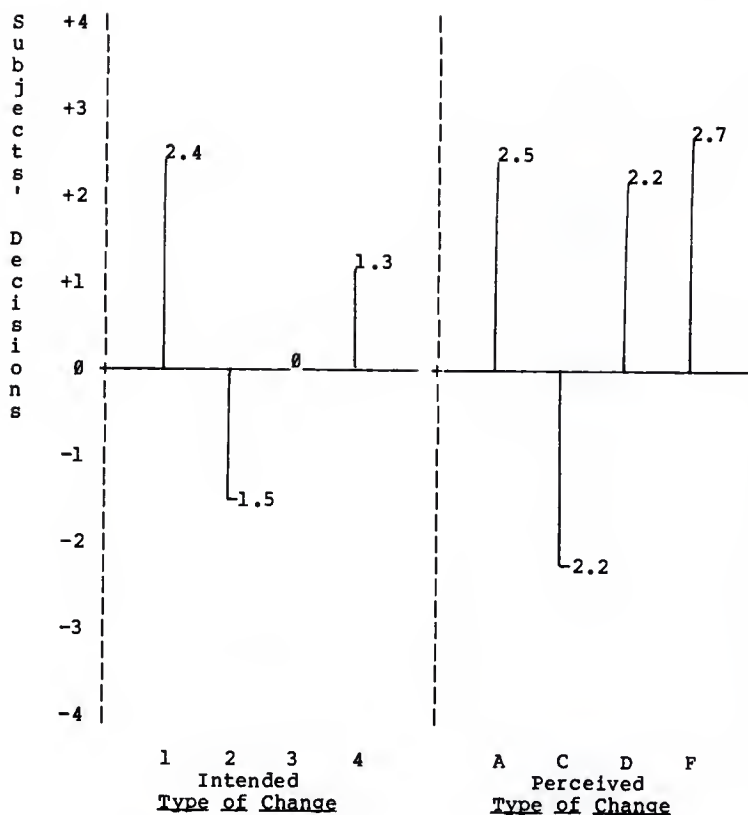


Expectations for Average of Variable "Difference":

Intended Perceived

<u>Label</u>	<u>Label</u>	<u>Expectation</u>
Type-1	A	Positive
Type-2	C	Negative
Type-3	D	Zero
Type-4	F	Positive

Figure 5-1. Plots of the Average of Variable "Difference" as a Function of Intended and Perceived Changes



Expectations for Average of Variable "Decision":

Intended	Perceived	
<u>Label</u>	<u>Label</u>	<u>Expectation</u>
Type-1	A	Positive
Type-2	C	Negative
Type-3	D	Positive
Type-4	F	Positive

Figure 5-2. Plots of the Average of the Variable "Decision" as a Function of Intended and Perceived Changes

Table 5-5. Comparison of the Intended and Perceived Results

Average by Type of Change for Variable "Difference"				
	1	2	3	4
Perceived Classification	3.0	-2.9	-0.2	1.2
Intended Classification	3.2	-1.9	-1.3	0.3
Expectation	Positive	Negative	Zero	Positive
Test	$P > I$	$P < I$	$P = 0$ $I \neq 0$	$P > I$
Result	$I > P^{**}$	$P < I$	$P = 0$ $I \neq 0$	$P > I$
z-score	.721	3.54*	I: 6.267* P: 1.232	3.748*

Average by Type of Change for Variable "Decision"				
	1	2	3	4
Perceived Classification	2.5	-2.2	2.2	2.7
Intended Classification	2.4	-1.5	0.0	1.3
Expectation	Positive	Negative	Positive	Positive
Test	$P > I$	$P < I$	$P > I$	$P > I$
Result	$P > I$	$P < I$	$P > I$	$P > I$
z-score	.471	2.905*	6.937*	5.614*

Notes:

I = Intended P = Perceived

* denotes significance at alpha = 0.05

** denotes case not in the expected direction

z-scores were computed using the formula for large sample tests of difference in means.

$$z = \frac{\bar{Y}_1 - \bar{Y}_2}{[(s_1^2/n_1) + (s_2^2/n_2)]^{.5}}$$

Type-3. Because the prediction for the Type-3 "difference" was that both the intended and the perceived results would equal zero, two separate tests were performed to see if they were different from zero. For a two-tailed test with alpha = 0.05, $z \geq 1.96$.

Examination of Figures 5-1 and 5-2 indicates seven out of eight cases (Figure 5-1-decision: type-2, type-3, and type-4; Figure 5-2-difference: type-1, type-2, type-3, and type-4) in which the perceived classification gave more positive (negative) results when positive (negative) results were expected. Table 5-5 contains the result of statistical tests for the differences in three pairs of the eight means represented in Figures 5-1 and 5-2. The z-scores are for one-tailed tests of differences between corresponding (perceived and intended) means for each type of change. Two tests for the variable "difference" type-3 change were necessary because the null hypothesis is that the intended and perceived means equal zero. To show that perceived data is more consistent with the expectations, the z-scores should be: (1) significant for all the differences in the means, (2) significant for the variable "difference" type-3 intended, and (3) not significant for the variable "difference" type-3 perceived (should not be different from zero). In one case (type-1) the means were in the wrong direction, but the difference in the means was not significant. Of the remaining correct-direction cases, all but one were statistically significant (see Table 5-5).

The above results indicate that experimental observations classified by perceived manipulations are different from those classified by intended manipulations. Furthermore, perceived-classification results are more similar to the expectations expressed in Chapter III than are intended-classification results. Therefore, the rest of the analysis emphasizes perceived-classification data.

Subject Reliability

Some of the subjects did not interpret the scenarios as intended. Therefore, there is a question of reliability. The first approach taken to verifying the subjects' reliability was to classify the subjects' responses as "good" or "bad" depending on the way they classified the scenarios. A subject's responses was classified as "bad" if 75% or more of his answers to question four (identify the type of change) disagreed with the expected answer (intended type of change). All other subjects were classified as "good." Once identified, separate data sets were designated "all-subjects", "good-subjects", "bad-subjects", and "only-good-responses." The "all-subject" data set contained all responses no matter how the subject was classified. The "good(bad)-subject" data set contained the responses of subjects classified as "good" ("bad"). The "only-good-

responses" data set contained only the scenarios in which the answer to question four agreed with the intended type of change. The means of the variables "difference" and "decision" were computed for each intended type of change within each data set. The means were then compared across data sets. Comparisons were made between the following data sets: (1) "all-subjects" vs "only-good-responses", (2) "all-subjects" vs "bad-subjects", and (3) "all-subjects" vs "good-subjects." These same comparisons were repeated for perceived classifications of type of change. For each comparison, a statistical test for differences in a population was performed. The test scores are presented in Table 5-6.

Table 5-6. Scores Resulting From Comparisons Between Dependent Variables Classified by Type of Change (Intended and Perceived) and Sets of Missclassified Data

Type of Change	All vs Only-Good		All vs Bad		All vs Good	
	Diff.	Dec.	Diff.	Dec.	Diff.	Dec.
<u>Intended</u>						
type-1	0.41	0.11	0.51	4.11*	0.21	1.35
type-2	0.73	0.56	0.00	0.00	2.06*	2.37*
type-3	1.07	1.06	2.97*	5.32*	0.00	7.08*
type-4	0.73	0.49	2.92*	3.58*	3.24*	5.35*
<u>Perceived</u>						
type-1	0.21	0.12	2.47*	2.19*	0.93	0.99
type-2	0.87	0.10	0.00	0.00	1.15	0.38
type-3	0.26	0.31	1.08	1.13	0.88	0.68
type-4	0.31	0.17	4.66**	8.35**	0.45	0.22
71 df 71 df						

df denotes degrees of freedom for score above

* denotes significance at $\alpha = 0.05$, z-test

** denotes significance at $\alpha = 0.05$, t-test

An examination of Table 5-6 indicates no systematic reason to exclude any group identified from further computations. When "all-subjects" is compared with "only-good-responses", no type of change is different. When "bad" subjects are eliminated from the total population the result is "good-subjects." The perceived classifications show no difference between the groups "all-subjects" and "good-subjects." Furthermore, when comparing the "all-subjects" group with the "bad-subjects" group, only four out of eight of the perceived classifications are significantly different. Based on the perceived classification, there is substantial evidence that the responses from all the subjects should remain in the analysis. The intended classifications are not as convincing. However, the remaining analysis will be performed with emphasis on the perceived classification. Hence, there is no reason to exclude subjects' responses from the analysis.

Another approach to data reliability is consistency within subjects. Some of the scenarios that were used were quite similar. However, only subjects who received the fourth package of scenarios (see Table 3-2) were exposed to two nearly identical scenarios, E3 and E4. Both E3 and E4 were designed for the change to be the deletion of a substitute control (an unnecessary batch total), but E4's change also included the addition of a complementary control. Therefore, subjects who received package four had a repeated measure of questions one and two (the only

questions asked before the change was recommended). As a result, reliability of responses could be inferred if there were no differences between these answers within subjects. The following test was devised: (1) the responses of all subjects who were given package four were partitioned into a data set; (2) the difference between each subject's answers to questions one and two was computed and labeled D1 and D2 respectively; (3) the average of D1 was computed across all subjects in the partitioned data set, and an identical process was followed for D2; and (4) each of the averages were statistically compared to zero. In neither case (D1 nor D2) was the average difference statistically different from zero (D1 z-score = 0.188, D2 z-score = 1.141) at $\alpha = 0.05$. As an added test, answers were averaged across subjects and the differences in the averages were computed (rather than taking the average of the differences). Again the differences were not significantly different from zero at $\alpha = 0.05$ (question one z-score = 0.094, question two z-score = 0.815).

Another threat to the validity of the analysis is the distribution of responses across experimental conditions. Because 100% of the questionnaires were not returned, there might be an unbalanced distribution of scenarios among independent variables. However, such was not the case, as is shown by Table 5-7.

Table 5-7. Distribution of Returned Scenarios by Independent Variable

Types of Changes					Total
	1	2	3	4	
Y C					
p o	E	41	39	43	45
e n					
s t	P	44	43	39	39
r					
o o	T	39	41	42	40
f l					
s	Total	124	123	124	124
					495

As a result of the above tests, it appears that there is no strong systematic reason to doubt the reliability of the subjects or data.

Hypothesis One

The first hypothesis tested is H_1 .

H_1 : The more ambiguous the decision, the greater the subject will rely on the source and tone of the message.

Clarity in a business decision is intended to mean the predominance of benefits over costs or vice versa. By reading the scenarios, the changes in costs and benefits of which the subjects would be aware are the increase (decrease) in the internal control strength and the increase (decrease) in cost for providing control changes. An examination of the changes in costs and benefits associated with each type of change permits a rough assessment of ambiguity. Each type of change is evaluated in terms of changes in costs and benefits in Table 5-8.

Table 5-8. Evaluation of Changes in Costs and Benefits for Types of Changes

<u>Type of Change</u>	<u>Intended Label</u>	<u>Perceived Label</u>	<u>Change in Benefits</u>	<u>Change in Costs</u>
Add a Complement	Type-1	A	increase	increase
Delete a Complement	Type-2	C	decrease	decrease
Delete a Substitute	Type-3	D	none	decrease
Replace a Substitute with a Complement	Type-4	F	increase	little or none

An examination of Table 5-8 indicates that the two changes "D" and "F" are unambiguously cost-beneficial. If subjects acted in a manner consistent with H_1 , they should have allocated less points to source and tone when they answered question four "D" or "F" than when they answered "A" or "C." Hence, the test for H_1 was that the average number of points that subjects have allocated to source and tone is greater for "A" or "C" than for "D" or "F." If $\bar{s}t_i$ is defined as the average points allocated to s and t for subjects who answered question four "i", then the following relationships should hold: $\bar{s}t_A > \bar{s}t_D$, $\bar{s}t_A > \bar{s}t_F$, $\bar{s}t_C > \bar{s}t_D$, and $\bar{s}t_C > \bar{s}t_F$. Table 5-9 contains the means of the points allocated to source and tone, classified by perceived type of change.

Table 5-9. Mean Points Allocated to Source and Tone, Classified by Perceived Type of Change

	Perceived Type of Change			
	A	C	D	F
Mean	36.2	24.9	39.4	32.7
n	132	141	83	71
Standard Deviation	25.5	22.9	26.9	26.4

An examination of Table 5-9 reveals the following ordering of the means: $\bar{s}t_A \uparrow \bar{s}t_D$, $\bar{s}t_A > \bar{s}t_F$, $\bar{s}t_C \uparrow \bar{s}t_D$, and $\bar{s}t_C \uparrow \bar{s}t_F$. Three of the four comparisons are in the wrong direction. Therefore, H_1 is not supported. One-tailed tests of difference in the means were performed to determine if the differences were statistically significant. The only difference that was in the correct direction, $\bar{s}t_A > \bar{s}t_F$, was not statistically significant (z -score = 0.911) at $\alpha = 0.05$. Two ($\bar{s}t_C < \bar{s}t_D$ and $\bar{s}t_C < \bar{s}t_F$) of the three comparisons that were in the wrong direction were statistically significant (z -score = 4.11 and 2.12, respectively) at $\alpha = 0.05$. The third ($\bar{s}t_A < \bar{s}t_D$) comparison in the wrong direction was not statistically significant (z -score = 0.866).

In considering why H_1 is not supported, an alternative approach was also used. Subjects were asked to allocate one hundred points among four factors that could have influenced their decision. One of the factors was the

economic cost-benefit effect of the change. It was argued above that ambiguity was a result of unclear cost-benefit decisions. Therefore, subjects should allocate more points to cost-benefit for those decisions that are clearly cost-beneficial ("D" and "F") than to those decisions for which the cost-benefit relationship is not clear ("A" and "C"). In other words, subjects should recognize that their decisions were more likely to be based on a cost-benefit argument in some cases, if they were. To be consistent with this idea, the averages of points allocated to cost-benefit by subjects should be as follows: $\bar{CB}_D > \bar{CB}_A$, $\bar{CB}_D > \bar{CB}_C$, $\bar{CB}_F > \bar{CB}_A$, and $\bar{CB}_F > \bar{CB}_C$. Table 5-10 present the average number of points allocated to cost-benefit classified by perceived change.

Table 5-10. Mean Points Allocated to Cost-Benefit, Classified by Perceived Type of Change

	Perceived Type of Change			
	A	C	D	F
Mean	56.2	65.3	54.9	57.6
n	132	141	83	71
Standard Deviation	27.5	27.8	28.4	28.2

An examination of Table 5-10 indicates that $\bar{CB}_D \nless \bar{CB}_A$, $\bar{CB}_D \nless \bar{CB}_C$, $\bar{CB}_F > \bar{CB}_A$, and $\bar{CB}_F \nless \bar{CB}_C$. In other words, the direction is inconsistent with the hypothesis that subjects' decisions were made mainly on a cost-benefit basis when the

cost-benefit relationship was clear. Therefore, the reason that H_1 is not supported is that subjects did not consider cost-benefit as the predominant decision factor only when the cost-benefit relationship was unambiguous.

Hypothesis Two

H₂: There will be no difference between the amount of reliance the subjects place on the source (either external auditors or systems analysts) of the criticism.

One way to test for a statistical relationship between the dependent variables and the independent variable source would be to perform analyses of variance (ANOVAs) for each of the dependent variables. Twenty ANOVAs were performed for the effects of the independent variables type of change, type of control, tone, and source on each of the dependent variables. Summary results are presented in Table 5-11 for these ANOVAs performed on data classified by both intended and perceived types of changes. The first entry in Table 5-11, 6.31, is the F-value for source from the ANOVA that used the following model: initial internal control rating = $c + t + s$. The entry under $PR > F, 0.0123^*$, indicates that the F-value of source was statistically significant at $\alpha = 0.05$. The perceived data entries used the same model except perceived type of change (answer to question four) was used in place of intended type of change.

Table 5-11. F-Values and Probabilities of Independent Variable "Source", from ANOVAs of Independent Variables on Selected Dependent Variables

<u>Dependent Variables</u>	<u>Intended Data</u>		<u>Perceived Data</u>	
	<u>F-Value</u>	<u>PR \geq F</u>	<u>F-Value</u>	<u>PR \geq F</u>
Initial IC-rating	6.31	.0123*	4.73	.0301*
Importance of IC Procedure	.95	.3299	.95	.3294
Difference	3.49	.0623	3.61	.0579
Overall Effect of Change	.71	.3995	1.07	.3004
Recommendation to Audit Committee	.47	.4913	1.33	.2494

* indicates significance at $\alpha = 0.05$

Because the two classes of source (external auditor and systems analyst) were designed to have the same impact on the subjects, it was expected that partitioning the subjects' answers by the variable "source" would not result in a statistically significant effect. However, these are measures of the manipulated variable "source." It does not mean that the response variable "source" (as measured by the points allocated to source by the subjects) was not a significant factor in the subjects' decision processes.

It can be seen from an examination of Table 5-11 that only one dependent variable (the subjects' initial rating of internal control strength) was significantly affected by

the type of source. However, the initial internal control rating was made before the outside source made the recommendation. Therefore, the significance of the independent variable "source" on the subjects' decisions was merely a statistical artifact. An ANOVA which included interactions was also performed, and the results of the interaction between type of change and source was not significant ($PR > F = 0.4204$). In other words, there is good supporting evidence in favor of H_2 .

H_2 could be extended to imply that "source" might interact with "type of change" to increase (or decrease) its effect on the subjects' final decisions. There are no a priori expectations for this extension of H_2 , which is purely exploratory in nature. One could predict that the average recommendation (variable "decision") classified by type of perceived change would become stronger (weaker) if the effect of the external auditor was greater (less) than that of the systems analyst. Table 5-12 shows the expected effects of source on type of change.

Table 5-12. The Expected Effects of Source on Average Recommendation When Classified by Type of Change

<u>Nature of Change</u>	<u>Intended Type of Change</u>	<u>Subjects' Perceptions</u>	<u>Initial Direction</u>	<u>Expected Order Assuming External Auditor</u>	
				<u>Increases Effect</u>	<u>Decreases Effect</u>
Add	1	A	Positive	EA>A>SA	SA>A>EA
Delete	2	C	Negative	SA>A>EA	EA>A>SA
Delete	3	D	Positive	EA>A>SA	SA>A>EA
Replace	4	F	Positive	EA>A>SA	SA>A>EA

Note: EA stands for External Auditor
 SA stands for Systems Analyst
 A stands for Average

If the classified averages fell in the predicted directions under either assumption, one would have reason (if not a statistically significant reason) to suggest that the external auditor or the systems analyst had a greater effect on the subjects, depending on which set of predictions was realized. Figure 5-3 depicts the results of the interaction of source and type of change on subjects' decisions. Table 5-13 presents the averages of \bar{d} classified by both perceived type of change and source.

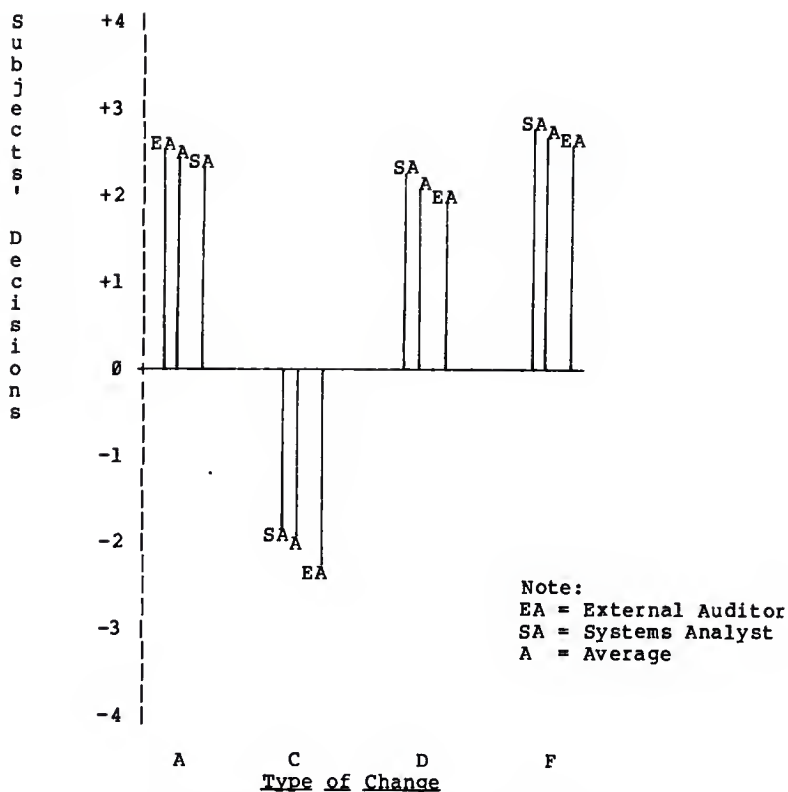


Figure 5-3. "Source" Influence of the Average of the Subjects' Decisions as a Function of Perceived Change

Table 5-13. Means of Average of Variable "Decision" Classified by Perceived Type of Change and Source of Recommended Change

Perceived Type of Change	<u>Source of Recommended Change</u>		
	(EA) External Auditor	(SA) Systems Analyst	(A) Overall Average
Add a Complement	2.6	2.4	2.5
Delete a Complement	-2.4	-1.9	-2.2
Delete a Substitute	1.9	2.3	2.1
Replace a Substitute with a Complement	2.7	2.8	2.7

It can be seen from Figure 5-3 and Table 5-13 that 50% of the averages are consistent with the assumption that external auditors have the greater impact (type-1 and type-2), and the other half are consistent with the assumption that systems analysts have the greater impact (type-3 and type-4). This is consistent with H_2 , that alternative sources have no systematic effect on decision.

An ANOVA of the form: $d = c + s + t + s * t$, indicated that neither the independent variable "source" nor the interaction, $s * c$, was significant in predicting d .

Tone

Another independent variable was tone. The tone of the recommended change was manipulated over two levels: strong and weak. In examining tone, attention was paid

to two aspects of the manipulation. First, did the subjects notice the manipulation of tone? Second, did tone, as an external manipulation, influence the subjects' decisions?

Two approaches were used to test the question of whether the subjects attended to the manipulation of tone. The simplest test was the final question in the experimental instrument, which read (for those receiving external auditor packages)

Some of the external auditor's recommendations were stronger than others. How important do you believe the strength of the recommendation was in influencing your judgment?

Answers were solicited on a scale of very important (+4) to not important (-4). The average response was -0.72.

Subjects were also asked to allocate one hundred points to the factors which influenced their judgment. If the manipulation of tone were successful, one would expect that, on the average, more points would be allocated in scenarios with the strong manipulation than in scenarios with weak manipulations. All responses were classified into strong and weak groups according to the intended manipulations, and the allocation of points to tone was computed for both categories. The results of a test for difference in means were not significant at the $\alpha = 0.05$ level. However, the difference is in the predicted direction. The results are presented below in Table 5-14.

Table 5-14. Test of Difference in Mean Points Allocated to Tone When Responses are Classified by Intended Manipulation of Tone

<u>Manipulation</u>	<u>Mean Allocation of Points to Tone</u>	<u>Standard Error of the Mean</u>
Strong	10.72764228	.92210967
Weak	9.65261044	.81310997

Z-Score = 0.711266

Hypothesis Three

H₃: The change in the internal control ratings will be a function of the subject's classification of the type of change, as is specified in Table 3-4.

This hypothesis can be restated in terms of the variable "difference." The sign of the variable "difference" is a function of the subject's perception of the type of change (answer to question four). Even though there were four intended manipulations of type of change, the subjects were given the option of selecting one of six types of change (A through F) in response to question four. This portion of the analysis will be performed using all six possible responses because there is no more reason for excluding the two answers that could not be correct (B and E) than for excluding a misclassified response which happened to be one of the possibly correct answers (A, C, D, and F). Therefore, expectations for the value of the variable "difference" were developed in all six cases (see Table 5-15).

Table 5-15. Expected Values of the Variable "Difference" for All Perceived Types of Changes

<u>Subject's Perception</u>	<u>Expected Value of Variable "Difference"</u>
A, Add a Complement	Positive
B, Add a Substitute	Zero
C, Delete a Complement	Negative
D, Delete a Substitute	Zero
E, Replace a Substitute with a Substitute	Zero
F, Replace a Substitute with a Complement	Positive

Given the expectations in Table 5-15, it is easy to formulate a statistical hypothesis for each type of change. For all six cases the null hypothesis is that the average value of the variable "difference" is zero. For the positive (negative) expected values the alternative hypothesis is that the average value of the variable "difference" is greater (less) than zero. This is a one-tailed test, and the t-score and z-score rejection values for $\alpha = 0.05$ are about 1.645 (exact t-score values for each sample size are given in Table 5-16). It is desirable to reject each positive-type (negative-type) hypothesis in favor of the alternative hypotheses. For the zero expected values, the alternative hypothesis is that the average value of the variable "difference" is not equal to zero. This is a two-tailed test, and the z-score rejection value for α

$\alpha = 0.05$ is 1.96. It would not be desirable to reject the zero-type hypotheses. The results of these tests are reported in Table 5-16.

Table 5-16. Tests of the Variable "Difference" Classified by Type of Change

Type of Change	Expected Value of "Difference"	H_a	Mean	Sample Size	$t_{.05}$ Rejection Region	Z-score
A	Positive	$\bar{X} > 0$	2.97	132	1.645	13.966*
B	Zero	$\bar{X} = 0$	-1.46	35	2.042	3.496**
C	Negative	$\bar{X} < 0$	-2.91	141	1.645	16.027*
D	Zero	$\bar{X} = 0$	-0.17	83	1.99	1.232
E	Zero	$\bar{X} = 0$	-0.20	25	2.06	.348
F	Positive	$\bar{X} > 0$	1.79	71	1.71	5.757*

* statistical significance at $\alpha = 0.05$, one-tailed test

** statistical significance at $\alpha = 0.05$, two-tailed test

An examination of Table 5-16 indicates that five of the six means are consistent, at statistically significant levels, with the expected values. In other words, the three positive-type and negative-type hypotheses were rejected in favor of the alternative hypotheses, and two of the zero-type hypotheses were not rejected. The only nonsupportive case occurred when one of the zero-type hypotheses was rejected (it was in favor of the general hypothesis to accept the zero-type hypotheses and reject the others). The "failed" hypothesis was for type of change B, add a substitute. No explanation for this answer has been devised. If the average of the variable "difference" for B

had been positive, than one might put forward the possibility that the addition of any control, even a substitute, might increase internal control strength. However, the average was significantly negative. The author can offer no explanation for why the addition of a substitute might decrease internal control effectiveness.

Path Analysis

The fourth hypothesis is a test of the five-variable path analysis model developed in Chapter IV. In order for the model to "fit", H_4 cannot be rejected.

H_4 : The path analysis will "fit", i.e.,
 $r_{ti.sc} = 0$ and $r_{si.tc} = 0$

Hayes [1973, p. 711] and Steel and Torrie [1960, p. 303] give the formulations for partial correlations (see Appendix F). The correlation coefficients in Table 5-17 and the formulations in Appendix F were used for making the computations necessary to test H_4 . These partial correlation coefficients are also reported in Table 5-17.

Table 5-17. Correlation Coefficients For Variables in the Path Analysis Model

	d	i	c	s	t
d	1	.080	.682	.216	.050
i		1	.102	.039	-.094
c			1	.152	-.014
s				1	0.0
t					1

$$r_{ti.c} = -.003, \quad r_{ts.c} = .027, \quad r_{is.c} = .077$$

$$r_{ti.sc} = -.005, \quad r_{si.tc} = .077$$

Both partial correlation coefficients are close enough to zero to say that the model fits.

Another test of a path analysis model is to decompose each covariation into its causal and noncausal paths. If this can be done, the model "fits" and the computations have been done correctly. Table 5-19 is a decomposition table for the five-variable model which accounts for all the covariation using the techniques specified in Table 4-5.

One of the problems in applying path analysis to the current model is that the variable type of change (either perceived or intended) is not on an interval scale. Two solutions present themselves: (1) use a surrogate for type of change; or (2) perform a path analysis within each type of change, and compare results across changes. Both approaches were adopted. A list of the variables used in

the path analysis and the source of the data used to estimate them is presented in Table 5-18.

Table 5-18. Variables Used in Path Analysis

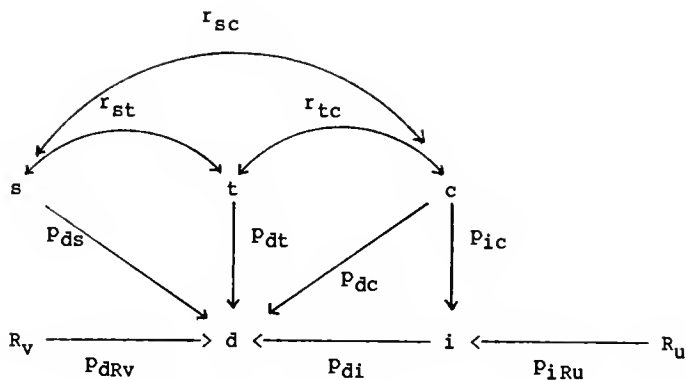
<u>Abbreviation</u>	<u>Variable</u>	<u>Source of Variable</u>
s	Source	Points allocated to source
t	Tone	Residual from regressing the points allocated to source on the points allocated to tone
c	Type of Change	Difference in answers to questions 3 and 1
i	Importance	Answer to question 2
d	Decision	Answer to question 7

The surrogate used in place of "type of change" was "difference" (question three less question one). This surrogation reduces the variable "type of change" from a four-level class variable to a continuous variable. Each type of change has an expected effect on internal control strength. For example, an add-a-complement change would result in an increased internal control rating. Therefore, the variable "difference" should be positive. Moreover, the greater the subject's perception of the improvement in internal control, the greater the variable "difference" would be. Similar observations can be made about the other types of changes: (1) delete a substitute will result in a zero difference; (2) delete a complement will result in a negative difference; and (3) replace a substitute with a

complement will result in a positive difference. However, there is a loss of information when "difference" replaces "type of change." This is easily seen by comparing type-1 and type-4 changes. Both changes result in positive differences because they both add a complement. However, type-4 also deletes a substitute. Therefore, assuming approximately the same cost for both added controls, type-4 is more advantageous because of the cost savings associated with deleting the unnecessary control.

Path Model for All Data

The method outlined in Chapter IV was used to estimate the path coefficients utilizing all the data in an unclassified fashion. A decomposition of the bivariate covariations was also performed. The results are presented in Figure 5-4 and Table 5-19.



Structural Equations

$$i = p_{ic}c + p_{iu}R_u$$

$$d = p_{ds}s + p_{dt}t + p_{dc}c + p_{di}i + p_{dv}R_v$$

Path Values

$$p_{sc} .152 \quad p_{st} 0.0 \quad p_{tc} -0.014$$

$$p_{ds} .115 \quad p_{dt} .061 \quad p_{dc} .664$$

$$p_{ic} .102 \quad p_{di} .014 \quad p_{Rv} .720$$

$$p_{Ru} .995$$

Figure 5-4. Unclassified Path Analysis Model Using All Data

Table 5-19. Decomposition of Path Coefficients From
Unclassified All-Data Model

<u>Bivariate</u> <u>Relation</u>	<u>Total</u> <u>Covariance</u>	<u>Causal</u>		<u>Noncausal</u>	<u>Total</u>
		<u>Direct</u>	<u>Indirect</u>		
d s	.21635	.11511	none	.10092	.21603
d t	.05019	.06109	none	-.00901	.05208
d c	.68201	.66396	.00141	.01663	.68200
d i	.08010	.01386	none	.06918	.08304
i c	.10164	.10164	none	none	.10164

To understand the meaning of the path model and decomposition table, the paths are discussed in turn.

The path between source and decision, p_{ds} , has a value of 0.115. If it were not for the unanalyzed paths between s , t , and c , an interpretation could be made in terms of a one-unit (one standard deviation) change in s causing a 0.115-unit change in d . However, the unanalyzed covariation among independent variables prevents this because the causal relationship among the independent variables is unknown. Therefore, the indirect effects among the independent variables are also unknown. The value of the path indicates that source is second only to type of change in influencing the subjects' decisions. The total covariation between d and s is 0.216. Hence, p_{ds} is 53% (.115/.216) of the covariation.

The path between tone and decision, p_{dt} , has a value of 0.061, which is about half as important as source and next to

the last in overall importance. The total covariation is 0.052, which is less than the path coefficient by 0.009, the noncausal effect. This is interesting because we see that the noncausal paths can serve to decrease the total covariation. From the perspective of percentage of total covariation, tone is more important than type of change.

The path between type of change and decision, p_{dc} has a value of 0.664, which is 97% of the total covariation between \underline{d} and \underline{c} . Of the variables examined, this one has the greatest importance in determining decision. The positive sign of the path can be interpreted as meaning that the larger the change in internal control strength (brought about by a change in controls), the larger the impact on the subject's decision. There is also an indirect effect through the variable that measures the importance of the procedure being changed, \underline{i} . This indirect cause has a path value of only 0.001 ($p_{ic} \times p_{di}$).

The path between \underline{i} and \underline{d} is a result of the sum of two effects: the indirect effect of change acting through \underline{i} and the independent effect of \underline{i} on \underline{d} . The value of the path p_{di} is only 0.014, but that represents 16.8% of the total covariation between \underline{d} and \underline{i} . This variable has the least impact on \underline{d} .

In order of importance the variables are \underline{c} , \underline{s} , \underline{t} , and \underline{i} . All four variables are directly related to the magnitude of the decision.

Path Analysis: Classified by Type of Change

Path coefficients were computed for subsets of the data classified by perceived types of change. These coefficients are presented in Table 5-20. The results of the unclassified model have been included for ease of comparison.

Table 5-20. Path Coefficients for Classified and Unclassified Models

<u>Class</u>	<u>Pds</u>	<u>Pdt</u>	<u>Pdc</u>	<u>Pdi</u>	<u>Pic</u>	<u>PiRu</u>	<u>PdRv</u>
All	.115	.061	.664	.014	.102	.995	.720
Add a Complement	.023	-.088	.239	.189	.429	.943	.773
Delete a Complement	.053	.121	.286	-.030	-.341	.976	.906
Delete a Substitute	.020	.009	.186	-.051	.053	.999	.986
Replace a Substitute with a Complement	-.016	-.169	.233	-.047	.354	.939	.861

To simplify the analysis of the data in Table 5-20, it was reduced to ordinal data. This was done using the absolute value (rather than the signed value) to prevent the possibility of ranking a path with a value of 0.001 above a path of -.350. The rankings are reported in Table 5-21.

Table 5-21. Path Coefficients in Order of Magnitude by Perceived Type of Change

Relative Rank of Path	Average Over All Types	Classified Models			
		Add a Comp.	Delete a Comp.	Delete a Sub.	Replace a Substitute With a Comp.
Largest	c(+)	c(+)	c(+)	c(+)	c(+)
2 nd Largest	s(+)	i(+)	t(+)	i(-)	t(-)
3 rd Largest	t(+)	t(-)	s(+)	s(+)	i(-)
4 th Largest	i(+)	s(+)	i(-)	t(+)	s(-)

abbreviations:

comp. complement

sub. substitute

Note: The signs of the coefficients are presented in parentheses.

Tables 5-20 and 5-21 can be examined based on the changes in rankings that occur as the paths are varied by type of change.

Add a complement model. In this model, p_{dc} has the largest path value, as it does in all the other classified models and in the overall model. However, in percentage terms (comparing the second largest path to the largest path) it is much smaller in the classified models than in the overall model. In the overall model, p_{di} was the least important path. In this model, p_{di} is the second largest path, and it is very close to the largest in percentage terms. In the overall model, the second

largest was 17% as large as the largest. In this model, the second largest is 79% as large as the largest path. In the overall model the indirect effect of c through i on d was $(0.014 \times 0.102 =) 0.001$. In this model, the indirect effect is $(0.189 \times 0.429 =) 0.081$, which is close to being as large as the third largest direct path. The path for tone, p_{dt} , did not change much in magnitude in this model compared to the overall model, but the sign changed, an indication that the more important the tone was, the less likely the decision was to be positive. The sign of this path is consistent with the unexplained inverse relationship between tone and decision that was discussed above. Finally, p_{ds} dropped from second largest to an ineffective fourth place in this model.

Delete a complement model. The most interesting aspect of this model is the signs of p_{di} and p_{ic} . Both are negative. The value of the signs means that the independent influence of i is inversely related to d , while the indirect influence of c through i is positive (indirect effect = $p_{di} \times p_{ic}$) so that these two effects work against each other. However, the indirect effect is small $(-0.03 \times -0.341 = 0.010)$ relative to the effect of i , -0.03 . In terms of rankings this model is nearly identical to the overall model. Only i and s are reversed.

Delete a substitute model. In this model, p_{di} is negative, as in the delete a complement model, but p_{ic} is

positive. This has the effect of making both "independent importance of the procedure" and the indirect effect of c through i inversely related to d while the other independent variables are directly related. The size of the paths in this model is approximately the same as in the other classified models. The rankings of the paths in this model are similar to the add a complement model with the t and g reversed.

Replace a substitute with a complement model. The signs of p_{dt} , p_{ds} , p_{di} , and p_{ic} in this model are negative as are p_{di} and p_{ic} in the delete a substitute model and p_{dt} in the add a complement model. However, the sign of p_{ds} is negative for the first time. Hence, the only positive path affecting d is p_{dc} , which is also the largest. In this model, as subjects placed greater emphasis on the effects of g , t , and i , they tended to reject the proposed change. On the other hand, as the subjects perceived increases in internal control strength (brought about by proposed changes) they tended to recommend accepting the changes.

Chapter Summary

The analysis of the results in this chapter are divided into two groups of tests: (1) background analysis and (2) hypothesis testing and path analysis. In the background analysis, it was shown that missclassified data could be included with other data without systematically distorting the results. It was also shown that the inclusion of data

from low reliability subjects had no systematic impact on the results. A repeated measures test indicated consistency within subjects. It was decided that the interpretation of the data based on the subjects' perception of the manipulated variables would be different than an interpretation based on the intended manipulation.

The first hypothesis (subjects' decisions would be contingent on the degree of ambiguity in the scenario's cost-benefit data) was not supported. The second hypothesis (source credibility) was supported. The third hypothesis (consistency between the variable difference and expected effects of perceived type of change) was supported. The fourth hypothesis (fit of the path analysis model) was supported.

The path analysis section showed that the variable "type of change" was the leading factor in the subjects' decisions. Classifying the data within "types of changes" resulted in different path models, which indicated that the average decision model was contingent upon the "type of change".

CHAPTER VI SUMMARY AND CONCLUSIONS

This chapter has four sections: (1) a summary of this research, (2) the conclusions and implications that were drawn from the analysis, (3) the limitations of the study, and (4) suggestions for further research.

Summary

This study explored some of the factors that influence the actions of managers of internal control systems. In Chapter I the line of authority between the board of directors and the internal audit group was established. It was concluded that while the audit committee had ultimate responsibility for the system of internal controls, the day to day management of the system was the duty of the internal audit group. That is not to say that the internal audit group performs all the internal control duties. Rather, the internal audit group has responsibility to insure that the system is operating correctly and to evaluate and implement changes in the system. The scope of the study was limited to studying the following factors which influence internal auditors who in turn must evaluate changes recommended by external auditors: cost-benefit, source, tone, and

the importance of the procedure. Motivations for the study were found in the increasing importance of corporate audit committees, the FCPA, and the impact of EDP-related fraud.

In Chapter II the assumption was made that internal control judgments are based primarily on cost-benefit considerations. Chapter II included a literature review of the following areas: external auditors' reliance on internal auditors' work, auditors' ability to make internal control judgments, and source credibility. The chapter concluded with a general model of factors influencing internal auditors' responses to external criticism of the system of internal controls.

Chapter III included a general model of corporate behavior, a description of the experimental design and task, a description of the subjects, and the pilot testing procedures. The three hypotheses developed in Chapter III were:

- H₁: The more ambiguous the decision, the greater the subject will rely on the source and tone of the message.
- H₂: There will be no difference between the amount of reliance the subjects place on the source (either external auditors or systems analysts) of the criticism.
- H₃: The change in the internal control ratings will be a function of the subject's classification of the type of change, as is specified in Table 3-4.

Chapter IV was devoted to a review of the principles of path analysis and the combination of Chapter II's general model, the variables described in Chapter III, and the path analysis methods in Chapter IV. A five-variable model was described, and a test of the model's fit was proposed. Hypothesis H_4 , a test of the degree of "fit", specified two partial correlation coefficients which would be expected to equal zero, if the model "fit."

Chapter V was devoted to analysis of the results. It was divided into two major groups of tests: (1) background analysis and (2) hypothesis testing and path analysis. The background analysis established several things. First, missclassified data were compared to "all-data" and subsets of "all-data". It was decided that the missclassified data did not have a statistically significant impact overall. Second, the reliability of some of the subjects was questioned. However, tests indicated that the inclusion of the low reliability subjects' data had no systematic impact on the results. The decision was made not to exclude the subjects identified as potentially unreliable. Subject reliability was also tested with a repeated measures test, which indicated consistency within subjects. Third, when asked to classify the experimentally manipulated variables, the subjects indicated a different perception of the scenarios than was intended. It was felt that the data would be interpreted differently if it were classified by

perceived rather than intended manipulations. The upshot was that classification by subjects' perceptions caused results to be more consistent with prior expectations than did classification by intended manipulation. Hence, it was decided to emphasize perceived classifications of the data for the remainder of the analysis.

The other major group of tests consisted of hypothesis testing and path analysis. The first hypothesis expressed the view that the subjects' decision models would be contingent on the degree of ambiguity of cost-benefit data in the scenarios. This hypothesis was not supported. Subjects' reliance on source and tone did not vary with the ambiguity of the scenarios.

The second hypothesis was concerned with source credibility. The experiment was designed so that external auditors were the source of the recommended changes in internal control. However, to insure that any equally credible source would have the same results, half the subjects were given recommendations from systems analysts. H_2 was supported: statistically the subjects responded the same for either source.

Several tests were performed on the independent variable "tone." On average, subjects thought that the tone of the recommendation was about halfway between "very important" and "not important" on a nine-point scale. Subjects allocated more points to tone for the strong-tone

group than for the weak-tone group. However, the difference between strong-tone and weak-tone was not statistically significant. When tone was an independent variable in an ANOVA with decision as the dependent variable, tone was not significant. However, the interaction between tone and type of change was statistically significant. The interactions between tone and each type of change were examined graphically and statistically. A trend was obvious, especially for the types of change classified by subjects' perceptions. Within types of change, tone had an inverse relationship with decision. No explanation was offered for this phenomenon.

The third hypothesis predicted that the variable difference would be consistent with the expected effects of perceived types of change. Six types of change were used in this analysis because the analysis depended only on what the subjects perceived. Only one of the six classifications was not in the predicted direction, and only one of those in the predicted direction was not statistically significant.

The fourth hypothesis, which dealt with the "fit" of the path analysis model, was supported. The path analysis was performed on all the data. It was felt that the use of the variable "difference" in place of "type of change" resulted in a loss of information. Therefore, the path analysis was repeated for subsets of data classified by types of change. In the unclassified path analysis the

perceived change in internal control, which was a surrogate for type of change, was the most important factor in the subjects' decisions (recommendations to their audit committees). The next most important factor was source. Even though varying the source had no effect on decision, as expected, the subjects considered source in their decision process. Tone was also considered. As earlier results indicated, the relation between tone and type of change was inverse. In this model, the factor "importance" was not found to be salient. However, it was not eliminated from the model because it became salient in subsequent models. In general, the unclassified model explained 48% of the variance in the model.

Recomputing the path coefficients for data classified by type of change showed several things. The classified models were different enough from the unclassified models to indicate that information was lost by replacing type of change with the variable "difference." Factors that were unimportant in the unclassified model became relatively important in the classified model. Finally, the classification of data resulted in changes in the signs of path coefficients.

Conclusions and Implications

The conclusions of this study are subject to the limitations which are detailed below. One of the major

limitations is that the results may not be generalizable beyond the subjects and experimental setting of this study.

The subjects did not distinguish between the two sources, external auditors and systems analysts. In other words, subjects attributed the same level of professionalism and expertise to either source. This implies that internal auditors do not view external auditors as a source of "gratuitous" criticism, made only because it is expected.

The subjects responded to tone classified within type of change in an inverse fashion. In other words, as tone increased within a type of change, the subjects were less and less predisposed to make the proposed change. The obvious conclusion is that current understanding of the subjects' motives is inadequate to predict the observed behavior. The unclassified path model gives no indication of this inverse relationship. However, the unclassified model does not adequately account for type of change. On the other hand, when individual path models are prepared, two of the p_{dt} values become negative. Also, the p_{dt} values are relatively larger in the classified models than in the unclassified models, which implies that the classified p_{dt} s had a canceling effect in the unclassified model.

Examination of the unclassified path model leads to the conclusion that the "difference" in reliability contributed by the internal control change is overwhelmingly the most important factor influencing the subjects' decision. It

appears to be close in value to the total unexplained effects (0.664 compared with 0.720). However, this is misleading. When type of change is separated from difference in the classified path models, the effect of difference is approximately 1/3 as large as in the unclassified path models. The path value for "difference", p_{dc} , in the classified path models explains only the effects of the subjects' relative evaluation of the importance of the change on internal control without cost information.

The results of this study have implications for the actions of various groups. If future research would permit greater external validity, one could make the following conclusions. External auditors should not rely on varying the tone of their management letters in order to elicit different responses from management. This method appears to have unpredictable consequences. On the other hand, changing the context of a management letter to emphasize the increase in internal control effectiveness (type of change) would appear to be an excellent way to increase or decrease the impact of a management letter. When adding a control, detailing the importance of the procedure being changed is also very effective. Emphasis on the position of the person who is writing the letter is necessary when attempting to persuade management to make a change that cannot be justified on other grounds.

From an internal auditor's point of view, the results indicate a high level of professionalism. Decisions were made based on the impact that changes had on internal control, almost without regard to source or tone. The unexpected results of H_1 (subjects' decisions are contingent on the ambiguity in the scenario) may be due to limitations of this study rather than to a lack of understanding by internal auditors or to the incorrectness of the hypothesis. This conclusion is based on the existence of contradictory evidence. Subjects reported that they did not key their cue weightings to their cost-benefit evaluation, but they acted as though they did. There may have been some confounding between costs and benefits that may explain this phenomenon. Costs were unknown, while the benefits of each change were specific but intangible.

If these findings can be generalized, audit committees could conclude that they could treat their internal audit group's evaluation of proposed changes with confidence. The audit committee should not fear that the source of the management letter will have an undue influence on internal auditors because internal auditors reacted the same regardless of whether the source was the external auditor or the systems analyst.

Limitations of The Study

This study can best be characterized as a field experiment without the benefits of a laboratory setting.

For such studies, Campbell and Stanley [1963, p. 8] list eight possible threats to internal validity: (1) history, (2) maturation, (3) testing, (4) instrumentation, (5) regression, (6) selection, (7) mortality, and (8) interaction between selection, maturation, etc. Each of the threats to internal validity will be considered in turn. It might be tempting to discount history because this experiment was administered as a questionnaire. However, in one pilot test subjects were particularly interested in a scenario because they had recently had experiences with the type of problems illustrated in the scenario. This might have caused a history-like effect. However, any history effects should have been averaged out because the sample size was large and the subjects were assigned at random to the treatments. The amount of time required to complete the experimental task, approximately 30 minutes, was short enough to eliminate any concerns about maturation. Testing factors (fatigue or learning) might have had an impact. However, the order of the scenarios was systematically varied and randomly assigned to subjects. Instrumentation was not a problem. Regression was not a problem because predicted directions were always more extreme, rather than less extreme. Selection offers two potential threats. First, only a portion of the desired population made itself available for selection. Second, there is a possibility of non-response bias. In other words, the particular group of

subjects who were selected (or allowed themselves to be selected) may have made up a disproportionate share of the non-respondents. Mortality is not considered a threat because of the length of the experiment. However, mortality may have interacted with selection to contribute to any non-response bias.

This study is viewed as an initial exploratory effort with little pretense at external validity. The subjects were not selected without bias from all possible subjects. Furthermore, some subjects may have been included who should not have been. For example, only the more academically oriented members of NAA may have completed the experimental task. The experimental task was very narrow in scope, and some types of changes were relatively unrealistic (delete a complement). The experimental setting was foreign to the task. Only a limited number of treatments were varied, and the range within which these treatments varied was narrow and not necessarily representative. In other words, the results of this study should not be generalized beyond either the experimental setting or the actual subjects who responded.

Suggestions for Future Research

Suggestions for future research come from the literature review as well as from the results of the experiment. The professional judgment ability literature

suggests that, as the complexity of a task increases, judgment consensus decreases. This should be explored while controlling for or considering task overloading. Evaluation of internal controls is a multiple step process, and the identification of the complexity of each step requires additional descriptive research.

Empirical evidence, other than antecedent evidence, of the audit committee's relationships with the internal and external auditors should be explored to verify that the procedures followed by audit committees are consistent with the procedures that should be followed and with those which the committees claim to be following.

Descriptive research needs to be done to discover the weight auditors (internal and external) apply to cues in evaluating internal controls. Along the same line, descriptive research should be pursued to determine the differential weights used by auditors for cost and benefit data in making a decision. Furthermore, it would be interesting to know if auditors used the same weighting scheme for cost (benefits) to themselves versus costs to others. Finally, the usefulness to external auditors of utilizing internal auditors for some audit work should be explored from both the external auditor's and management's points of view.

APPENDIX A
INSTRUCTIONS FOR SUBJECTS

The next four pages contain xerographically reduced copies of the two sets of instructions which were given to subjects. The first two pages contain the instructions for subjects who received the "external auditor" treatment. The second set of instructions was for subjects who received the "systems analyst" treatment.

Below is a description of the task you will be asked to perform. Its focus relates to how individuals evaluate internal control systems. You will be asked to make judgments relating to specific internal control procedures in four companies. For each of the four companies, please assume the following:

1. You are the new internal audit manager.
2. You have just been hired from outside the company.
3. The company's external auditors have recently submitted a management letter at the completion of their audit.
4. The management letter includes a recommended change in the internal control system, which has been included under the heading of "EXTERNAL AUDITOR'S RECOMMENDATION."

Your task:

On the next page is a description of a basic corporate structure which is common to four companies. For each of the four companies, Alpha, Beta, Gamma, and Delta, specific internal control procedures are described. For each of the four companies:

1. Evaluate the internal control procedures described.
2. Answer questions about each company's internal control procedures independently. In other words, the facts of one company's procedures should NOT affect your answers to questions about the other companies' procedures.
3. Each change involves one or two controls. Controls can be loosely classified into two groups:
 (a) desirable controls- those controls that correct a weakness in the internal control procedure, and
 (b) undesirable controls- those controls that fail to correct a weakness in the internal control procedure, including redundant controls.

You will be asked to classify each change as one of the following:

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Confidentiality:

All of your answers will be kept completely confidential.

Time:

There is no specific time limit, but it is expected that it will take you about a half hour.

Basic Corporate Structure

This corporate structure is common to Alpha, Beta, Gamma, and Delta companies.

Your company is one of the largest manufacturers of men's clothing. Your company began using a computer-based accounting system to assist management 18 years ago. It was one of the first men's clothing manufacturers to begin to use computers. Most of the programs in the system were developed by your own highly efficient programming team. The company owned its computer system from the start and has kept pace with hardware developments. Also, the company has been careful to maintain a large, competent programming staff which updates the programs to accommodate hardware changes and develops changes required by management to improve service.

Your company licenses many of its programs to other manufacturers through the trade association. This has two major benefits: the revenue earned helps to defray programming costs, and the accuracy and reliability of the programming is verified by its use in other companies.

Below is a description of the task you will be asked to perform. Its focus relates to how individuals evaluate internal control systems. You will be asked to make judgments relating to specific internal control procedures in four companies. For each of the four companies, please assume the following:

1. You are the new internal audit manager.
2. You have just been hired from outside the company.
3. The organisational design requires that you report directly to the board of director's audit committee.
4. Each year the controller, who reports to the company president, employs an outside systems analyst to review the system of internal controls. The most recent analyst's report includes a recommended change in the internal control system, which has been included under the heading of "SYSTEMS ANALYST'S RECOMMENDATION."

Your task:

On the next page is a description of a basic corporate structure which is common to four companies. For each of the four companies, Alpha, Beta, Gamma, and Delta, specific internal control procedures are described. For each of the four companies:

1. Evaluate the internal control procedures described.
2. Answer questions about each company's internal control procedures independently. In other words, the facts of one company's procedures should NOT affect your answers to questions about the other companies' procedures.
3. Each change involves one or two controls. Controls can be loosely classified into two groups:
 (a) desirable controls- those controls that correct a weakness in the internal control procedure, and
 (b) undesirable controls- those controls that fail to correct a weakness in the internal control procedure, including redundant controls.

You will be asked to classify each change as one of the following:

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Confidentiality:

All of your answers will be kept completely confidential.

Time:

There is no specific time limit, but it is expected that it will take you about a half hour.

Basic Corporate Structure

This corporate structure is common to Alpha, Beta, Gamma, and Delta companies.

Your company is one of the largest manufacturers of men's clothing. Your company began using a computer-based accounting system to assist management 18 years ago. It was one of the first men's clothing manufacturers to begin to use computers. Most of the programs in the system were developed by your own highly efficient programming team. The company owned its computer system from the start and has kept pace with hardware developments. Also, the company has been careful to maintain a large, competent programming staff which updates the programs to accommodate hardware changes and develops changes required by management to improve service.

Your company licenses many of its programs to other manufacturers through the trade association. This has two major benefits: the revenue earned helps to defray programming costs, and the accuracy and reliability of the programming is verified by its use in other companies.

APPENDIX B SCENARIOS

The next 29 pages contain xerographically reduced copies of some of the scenarios used in the experimental instrument. Each scenario has a five-character designation and a page number at the top of the page. Most scenarios are two pages, long but a few are three pages long. The first two characters of the designation indicate whether the external authority was an external auditor (Cl) or a systems analyst (Ca). The next character designates the type of control being changed (T, E, or P). The fourth character designates the type of change being recommended (1, 2, 3, or 4). The last character designates the tone of the recommendation (s or w).

The scenarios are divided into three sections. The first nine pages contain a typical package of four scenarios (ClT3s, ClE4s, ClPlw, and ClP2w). The second section contains an example of a systems-analyst scenario (Caplw). The final section contains one of each type of control and type of change. The final section is arranged in the following order: ClT1, ClT2, ClT3, ClT4, ClE1, ClE2, ClE3, ClE4, ClP1, ClP2, ClP3, and ClP4.

CIT3s (1)

Gamma Co.— Order Verification Procedure

Preparation of raw materials purchases and scheduling to meet each new order are a part of the inventory management process that has been automated. Before a raw materials purchase order is generated, the customer's credit-worthiness and the order's authenticity are verified. The authenticity of orders is verified because of the possibility that "fake" orders might be placed. A salesman could collect commissions on the "fake" orders before he quit, and the returned orders would represent a substantial loss.

Both of these controls are used to verify the authenticity of an order:

1. There must be a duly authorized customer's purchase order. In the absence of a customer purchase order, a "house" purchase order may be used.
2. The customer is asked to provide a letter authorizing shipment.

Question 1. Please rate the strength or weakness of the internal control procedure relating to order verification. (Please circle your response.)

Very <u>Weak</u>				<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for order verification? (please circle your response.)

<u>Not Very Important</u>				<u>Very Important</u>
0	+1	+2	+3	+4

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

The request for a letter authorizing shipment is unnecessary and should be discontinued.

Note: The external auditor views this change as relatively more critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the order verification control procedure? (Please circle your response.)

Very <u>Weak</u>				<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

CIT3s (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100) _____

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control Unaffected					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend Rejection								Strongly Recommend Acceptance
-4	-3	-2	-1	0	+1	+2	+3	+4

C1E4s (1)

Beta Co.—Accounts Receivable Data Entry Procedure

Your company has developed an Accounts Receivable program. The program is designed to maintain accounts on an invoice by invoice basis (rather than an open account basis), which reduces confusion about discounts, returns, etc. Accounts receivable are entered on-line in batches, containing no more than 25 transactions, from lists which have been prepared in another department where the checks are recorded and deposited. Entries are made into a transaction file, which protects the main data file until the batch totals are proved, and the main data file is updated with the transaction file. Errors made in entering data are backed-out and entered correctly at the end of each batch. The list that goes to the data processing transaction entry department includes customer account number, customer name, invoice number, and amount of payment. The list is accompanied by an adding machine-prepared batch total of the payments. The current system requires that a second adding machine tape be prepared from the list in the data processing transaction entry department before the entries are made. The batches are already totalled in the mail room when the batches and deposits are prepared.

MAIL	EDP	EDP
ROOM	TRANSACTION	PROCESSING
Payments	ENTRY	Output includes
received	Batches	batch totals
& sorted into	entered.	which are compared
batches.	Batch totals	with totals from
	prepared	mail room and EDP
Lists are	from	transaction entry
prepared.	mail room	department.
Batch totals	lists.	
prepared from		
lists.		

Question 1. Please rate the strength or weakness of the internal control procedure relating to accounts receivable data entry. (Please circle your response.)

Very								Very
<u>Weak</u>				<u>Adequate</u>				<u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for accounts receivable data entry? (Please circle your response.)

Not Very					Very
<u>Important</u>					<u>Important</u>
0	+1	+2	+3	+4	

CIE4s (2)

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

We recommend that the second manual batch total be abandoned. We also suggest that a hash total of account numbers or invoices be prepared to verify that the correct accounts have been credited.

Note: The external auditor views this change as relatively more critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the accounts receivable data entry internal control procedure? (Please circle your response.)

Very Weak				Adequate				Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor)

The tone of the recommendation

Your own assessment of the economic cost-benefit impact on your company from the change

Other factors (please specify below)

Total (must add to 100)

100 points

Other factors: _____

CIE4s (3)

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control <u>Unaffected</u>					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>									Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

CIP1w (1)

Alpha Co.— Program and Data Integrity Procedure

The program development group has full access to the computer and data files to facilitate creation and testing of program changes. The program development group usually uses old accounts receivable and transactions files as convenient test decks.

Question 1. Please rate the strength or weakness of the internal control procedure relating to program and data integrity. (Please circle your response.)

Very <u>Weak</u>				<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for program and data integrity? (Please circle your response.)

Not Very <u>Important</u>				<u>Very Important</u>
0	+1	+2	+3	+4

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

We recommend that programmers be denied operational access to both the computer and the data files.

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the program and data integrity internal control procedure? (Please circle your response.)

Very <u>Weak</u>				<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

CIP1w (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100) _____

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control <u>Unaffected</u>					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>								Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

C1P2w (1)

Delta Co.— Program and Data Integrity Procedure

In the current system of organization, the company employs a full-time software librarian who works within the data processing department. However, the librarian's time is only partially occupied with EDP-library tasks.

Question 1. Please rate the strength or weakness of the internal control procedure relating to program and data integrity. (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for program and data integrity? (Please circle your response.)

<u>Not Very</u> <u>Important</u>					<u>Very</u> <u>Important</u>
0	+1	+2	+3	+4	

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

We recommend that the software librarian be trained as a computer operator in addition to his current duties, so that he can diversify his time across job functions as is needed.

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the program and data integrity internal control procedure? (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

C1P2w (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control <u>Unaffected</u>					Grestly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>								Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

CaPlw (1)

Alpha Co.— Program and Data Integrity Procedure

The program development group has full access to the computer and data files to facilitate creation and testing of program changes. The program development group usually uses old accounts receivable and transactions files as convenient test decks.

Question 1. Please rate the strength or weakness of the internal control procedure relating to program and data integrity. (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for program and data integrity? (please circle your response.)

Not Very <u>Important</u>					Very <u>Important</u>
0	+1	+2	+3	+4	

The following excerpt from the systems analyst's report was passed on to you:

SYSTEMS ANALYST'S RECOMMENDATION

We recommend that programmers be denied operational access to both the computer and the data files.

Note: The systems analyst views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the program and data integrity internal control procedure? (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

CaPlw (2)

- Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)
- addition of a desirable control
 - addition of an undesirable control
 - deletion of a desirable control
 - deletion of an undesirable control
 - a simultaneous deletion of an undesirable control AND the addition of an undesirable control
 - a simultaneous deletion of an undesirable control AND the addition of a desirable control

- Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the systems analyst) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

- Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control Unaffected						Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4			

- Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend Rejection								Strongly Recommend Acceptance
-4	-3	-2	-1	0	+1	+2	+3	+4

CLTW (1)

Beta Co.-- Order Verification Procedure

Preparation of raw materials purchase and scheduling to meet each new order are a part of the inventory management process that has been automated. Before a raw materials purchase order is generated, the customer's credit-worthiness and the order's authenticity are verified. The authenticity of orders is verified because of the possibility that "fake" orders might be placed. A salesman could collect commissions on the "fake" orders before he quit, and the returned orders would represent a substantial loss. The control used to verify the authenticity of an order is the presence of a customer's duly authorized purchase order. No special provisions have been made for phone orders.

Question 1. Please rate the strength or weakness of the above internal control procedure relating to order verification. (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>					Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for order verification? (Please circle your response.)

Not Very <u>Important</u>					<u>Very Important</u>
0	+1	+2	+3	+4	

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION: "The verification of phone orders is inadequate. We recommend that the customer be asked to provide a letter authorizing shipment or a duly authorized purchase order for phone orders."

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the order verification internal control procedure? (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>					Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4		

CITLW (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control Unaffected						Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4			

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend Rejection									Strongly Recommend Acceptance
-4	-3	-2	-1	0	+1	+2	+3	+4	

C1T2w (1)

Beta Co.-- Order Verification Procedure

Step 3:— Order verification. The preparation of purchase orders, materials purchases and scheduling to meet each new order are a part of the inventory management process that has been automated. Before a raw materials purchase order is generated, the customer's credit-worthiness and the order's authenticity are verified. The authenticity of orders is verified because of the possibility that "fake" orders might be placed. A salesman could collect commissions on the "fake" orders before he quit, and the returned orders would represent a substantial loss.

Two controls are used to verify the authenticity of an order:

1. There must be a customer's purchase order or a "house" purchase order, which has been duly authorized.
2. If the customer fails to provide a purchase order, he is asked to send a letter authorizing shipment.

Question 1. Please rate the strength or weakness of the internal control procedure relating to order verification.
(Please circle your response.)

Very								Very
Weak				Adequate				Strong
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for order verification? (please circle your response.)

<u>Not Very</u>				<u>Very</u>
<u>Important</u>				<u>Important</u>
0	+1	+2	+3	+4

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

EXTERNAL AUDITOR'S RECOMMENDATION
The letter authorizing shipment is unnecessary. It should not be required.

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the order verification internal control procedure? (Please circle your response.)

Very Weak					Adequate				Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4	

CIT2w (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor)

The tone of the recommendation

Your own assessment of the economic cost-benefit impact on your company from the change

Other factors (please specify below)

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control <u>Unaffected</u>					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>								Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

CLT3W (1)

Beta Co.-- Order Verification Procedures

Preparation of raw materials purchases and scheduling to meet each new order are a part of the inventory management process that has been automated. Before a raw materials purchase order is generated, the customer's credit-worthiness and the order's authenticity are verified. The authenticity of orders is verified because of the possibility that "fake" orders might be placed. A salesman could collect commissions on the "fake" orders before he quit, and the returned orders would represent a substantial loss.

Both of these controls are used to verify the authenticity of an order:

1. There must be a duly authorized customer's purchase order. In the absence of a customer purchase order, a "house" purchase order may be used.
2. The customer is asked to provide a letter authorizing shipment.

Question 1. Please rate the strength or weakness of the internal control procedure relating to order verification. (Please circle your response.)

Very Weak					<u>Adequate</u>					Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for order verification? (Please circle your response.)

	<u>Not Very</u>						<u>Very</u>
	<u>Important</u>						<u>Important</u>
	0	+1	+2	+3	+4		

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

The request for a letter authorizing shipment is unnecessary and should be discontinued.

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the order verification control procedure? (Please circle your response.)

Very Weak					<u>Adequate</u>					Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4		

C1T3v (2)

- Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)
- a. addition of a desirable control
 - b. addition of an undesirable control
 - c. deletion of a desirable control
 - d. deletion of an undesirable control
 - e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
 - f. a simultaneous deletion of an undesirable control AND the addition of a desirable control
- Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor)

The tone of the recommendation

Your own assessment of the economic cost-benefit impact on your company from the change

Other factors (please specify below)

Total (must add to 100) 100 points

Other factors:_____

- Question 6. If the recommended change were implemented, in your opinion how would the change effect the quality of the overall system of internal control? (Please circle your response.)

Greetly Reduce Internal <u>Control</u>					Internal Control <u>Unaffected</u>					Greetly Improve Internal <u>Control</u>
-4	-3	-2	-1	0	+1	+2	+3			+4

- Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>								Strongly Recommend <u>Acceptance</u>	
-4	-3	-2	-1	0	+1	+2	+3	+4	

CIT4w (1)

Alpha Co.— Order Verification Procedure

Preparation of raw materials purchases and scheduling to meet each new order are a part of the inventory management process that has been automated. Before a raw materials purchase order is generated, the customer's credit-worthiness and the order's authenticity are verified. The authenticity of orders is verified because of the possibility that "fake" orders might be placed. A salesman could collect commissions on the "fake" orders before he quit, and the returned orders would represent a substantial loss.

Two controls are used to verify the authenticity of an order: (1) the presence of a customer's purchase order, And (2) the presence of a customer's letter authorizing shipment.

Question 1. Please rate the strength or weakness of the internal control procedure relating to order verification. (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>					Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for order verification? (Please circle your response.)

Not Very <u>Important</u>					Very <u>Important</u>
0	+1	+2	+3	+4	

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

In the event that a customer's purchase order accompanies the order, it is not necessary to request a letter of authorization for the purchase. However, a list of the customer's personnel who may authorize a purchase should be maintained so that the authorizing signature may be compared with it.

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the order verification internal control procedure? (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>					Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4		

CIT4w (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control <u>Unaffected</u>					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>								Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

C1Elw (1)

Delta Co.—Accounts Receivable Data Entry Procedure

Your company has developed an Accounts Receivable program. The program is designed to maintain accounts on an invoice by invoice basis (rather than an open account basis), which reduces confusion about discounts, returns, etc. Accounts receivable are entered on-line in batches, containing no more than 25 transactions, from lists which have been prepared in another department where the checks are recorded and deposited. Entries are made into a transaction file, which protects the main data file until the batch totals are proved, and the main data file is updated with the transaction file. Errors made in entering data are backed-out and entered correctly at the end of each batch. Batch totals are not applied to the corrected batch before updating the main data file.

Question 1. Please rate the strength or weakness of the internal control procedure relating to accounts receivable data entry. Please circle a response.

Very <u>Weak</u>					<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for accounts receivable data entry? (Please circle your response.)

Not Very <u>Important</u>					<u>Very Important</u>
0	+1	+2	+3	+4	

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

We recommend that corrected batches be submitted to the same tests as uncorrected batches in case any errors were not properly corrected.

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the accounts receivable data entry internal control procedure? (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

C1E1w (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 188 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 188)

188 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control <u>Unaffected</u>					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>									Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

CIE2s (1)

Alpha Co.—Accounts Receivable Data Entry Procedure

Your company has developed an Accounts Receivable program. The program is designed to maintain accounts on an invoice by invoice basis (rather than an open account basis), which reduces confusion about discounts, returns, etc. Accounts receivable are entered on-line in batches, containing no more than 25 transactions, from lists which have been prepared in another department where the checks are recorded and deposited. Entries are made into a transaction file, which protects the main data file until the batch totals are proved, and the main data file is updated with the transaction file. Errors made in entering data are backed-out and entered correctly at the end of each batch. The list that goes to the data processing transaction entry department includes customer account number, customer name, invoice number, and amount of payment. If a check covers several invoices, each invoice is listed as a separate transaction.

The company uses two batch totals: the sum of the amounts to be credited to the accounts in each batch, and the sum of the account numbers involved. The second total is a verification that the account numbers were correctly entered into the system.

Question 1. Please rate the strength or weakness of the internal control procedure relating to accounts receivable data entry. (Please circle your response.)

Very								Very
<u>Weak</u>			<u>Adequate</u>					<u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for accounts receivable data entry? (Please circle your response.)

Not Very					Very
<u>Important</u>					<u>Important</u>
0	+1	+2	+3		+4

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

We feel that the second batch total is unnecessary.

Note: The external auditor views this change as relatively more critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the accounts receivable data entry internal control procedure? (Please circle your response.)

Very								Very
<u>Weak</u>			<u>Adequate</u>					<u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

C1E2s (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control Unaffected					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend Rejection								Strongly Recommend Acceptance
-4	-3	-2	-1	0	+1	+2	+3	+4

CIE3a (1)

Alpha Co.—Accounts Receivable Data Entry Procedures

Your company has developed an Accounts Receivable program. The program is designed to maintain accounts on an invoice by invoice basis (rather than an open account basis), which reduces confusion about discounts, returns, etc. Accounts receivable are entered on-line in batches, containing no more than 25 transactions, from lists which have been prepared in another department where the checks are recorded and deposited. Entries are made into a transaction file, which protects the main data file until the batch totals are proved, and the main data file is updated with the transaction file. Errors made in entering data are backed-out and entered correctly at the end of each batch. The list that goes to the data processing transaction entry department includes customer account number, customer name, invoice number, and amount of payment. The system requires that a second adding machine tape be prepared from the list in the data processing transaction entry department before the entries are made. The batches are already totalled in the mail room when the batches and deposits are prepared.

<u>MAIL ROOM</u>	<u>EDP TRANSACTION ENTRY</u>	<u>EDP PROCESSING</u>
Payments received & sorted into batches.	Batches entered.	Output includes batch totals which are compared with totals from mail room and EDP transaction entry department.
Lists are prepared.	Batch totals prepared from lists.	
Batch totals prepared from lists.		

Question 1. Please rate the strength or weakness of the internal control procedure relating to accounts receivable data entry. (Please circle your response.)

<u>Very Weak</u>				<u>Adequate</u>				<u>Very Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for accounts receivable data entry? (Please circle your response.)

<u>Not Very Important</u>				<u>Very Important</u>
0	+1	+2	+3	+4

CIE3s (2)

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

The electronic totalling procedure is very accurate. We recommend discontinuing the second manual batch total (prepared in the EDP transaction entry dept.).

Note: The external auditor views this change as relatively more critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the accounts receivable data entry internal control procedure? (Please circle your response.)

Very <u>Weak</u>				<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor)

The tone of the recommendation

Your own assessment of the economic cost-benefit
impact on your company from the change

Other factors (please specify below)

Total (must add to 100)

100 points

Other factors: _____

CIE3a (3)

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Grestly Reduce Internal <u>Control</u>					Internal Control <u>Unaffected</u>					Grestly Improve Internal <u>Control</u>
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>									Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4	

CLE4W (1)

Delta Co.—Accounts Receivable Data Entry Procedure

Your company has developed an Accounts Receivable program. The program is designed to maintain accounts on an invoice by invoice basis (rather than an open account basis), which reduces confusion about discounts, returns, etc. Accounts receivable are entered on-line in batches, containing no more than 25 transactions, from lists which have been prepared in another department where the checks are recorded and deposited. Entries are made into a transaction file, which protects the main data file until the batch totals are proved, and the main data file is updated with the transaction file. Errors made in entering data are backed-out and entered correctly at the end of each batch. The list that goes to the data processing transaction entry department includes customer account number, customer name, invoice number, and amount of payment. The list is accompanied by an adding machine-prepared batch total of the payments. The current system requires that a second adding machine tape be prepared from the list in the data processing transaction entry department before the entries are made. The batches are already totalled in the mail room when the batches and deposits are prepared.

MAIL ROOM	EDP TRANSACTION ENTRY	EDP PROCESSING
Payments received & sorted into batches.	Batches entered.	Output includes batch totals which are compared with totals from mail room and EDP transaction entry department.
Lists are prepared.	Batch totals prepared from mail room lists.	
Batch totals prepared from lists.		

Question 1. Please rate the strength or weakness of the internal control procedure relating to accounts receivable data entry. (Please circle your response.)

Very Weak					Adequate				Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4	

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for accounts receivable data entry? (Please circle your response.)

Not Very Important				Very Important
0	+1	+2	+3	+4

C1E4w (3)

Question 6. If the recommended change were implemented, in your opinion how would the change effect the quality of the overall system of internal control? (Pleasee circle your response.)

Greatly Reduce Internal Control					Internal Control Unaffected					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Pleasee circle your response.)

Strongly Recommend Rejection									Strongly Recommend Acceptance
-4	-3	-2	-1	0	+1	+2	+3	+4	

CIPIs (1)

Gamma Co.— Program and Data Integrity Procedure

The program development group has full access to the computer and data files to facilitate creation and testing of program changes. The program development group usually uses old accounts receivable and transactions files as convenient test decks.

Question 1. Please rate the strength or weakness of the internal control procedure relating to program and data integrity. (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>					Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for program and data integrity? (please circle your response.)

Not Very <u>Important</u>					Very <u>Important</u>
0	+1	+2	+3	+4	

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

We recommend that programmers be denied operational access to both the computer and the data files.

Note: The external auditor views this change as relatively more critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the program and data integrity internal control procedure? (Please circle your response.)

Very <u>Weak</u>					<u>Adequate</u>					Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4		

CLPIs (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Grestly Reduce Internal Control					Internal Control <u>Unaffected</u>					Grestly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>								Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

CIP2s (1)

Delta Co.— Program and Data Integrity Procedure

In the current system of organization, the company employs a full-time software librarian who works within the data processing department,. However, the librarian's time is only partially occupied with EDP-library tasks.

Question 1. Please rate the strength or weakness of the internal control procedure relating to program and data integrity. (Please circle your response.)

Very <u>Weak</u>				<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for program and data integrity? (please circle your response.)

Not Very <u>Important</u>				Very <u>Important</u>
0	+1	+2	+3	+4

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

We recommend that the software librarian be trained as a computer operator in addition to his current duties, so that he can diversify his time across job functions as is needed.

Note: The external auditor views this change as relatively more critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the program and data integrity internal control procedure? (Please circle your response.)

Very <u>Weak</u>				<u>Adequate</u>				Very <u>Strong</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

CIP2s (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Grestly Reduce Internal Control					Internal Control <u>Unaffected</u>					Grestly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend <u>Rejection</u>								Strongly Recommend <u>Acceptance</u>
-4	-3	-2	-1	0	+1	+2	+3	+4

C1P3w (1)

Beta Co.— File Disaster Recovery Procedure

The company's current practice is to maintain both accounts receivable records and transactions on tapes. The master file is updated each business day. Company policy is to file, in fireproof containers, old master files and transaction files for a six-month period, before erasing the tapes.

Question 1. Please rate the strength or weakness of the internal control procedure relating to file disaster recovery. (Please circle your response.)

Very Weak					<u>Adequate</u>				Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4	

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for file disaster recovery? (Please circle your response.)

Not Very Important					<u>Very Important</u>
0	+1	+2	+3	+4	

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

You are maintaining too many past tapes; the tapes from the three most recent business days would be adequate.

Note: The external auditor views this change as relatively less critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the file disaster recovery internal control procedure? (Please circle your response.)

Very Weak					<u>Adequate</u>				Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4	

CIP3w (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100) 100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control Unaffected					Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4		

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend Rejection								Strongly Recommend Acceptance
-4	-3	-2	-1	0	+1	+2	+3	+4

C1P4s (1)

Gamma Co.-- File Disaster Recovery Procedure

The company's current practice is to maintain both accounts receivable records and transactions on tapes. The master file is updated each business day. Company policy is to file, in fireproof containers, old master files and transaction files for a six-month period, before reusing the tapes.

Question 1. Please rate the strength or weakness of the internal control procedure relating to file disaster recovery. (Please circle your response.)

Very Weak					<u>Adequate</u>				Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4	

Question 2. Not referring to the specific procedure described above, how important to the overall system of internal controls is it to have an adequate control procedure for file disaster recovery? (Please circle your response.)

Not Very Important					Very Important
0	+1	+2	+3	+4	

The following excerpt from the external auditor's management letter was passed on to you:

EXTERNAL AUDITOR'S RECOMMENDATION

You are maintaining too many past tapes. In the event of an accident, the files can be recreated from the several most recent tapes. The tapes from the three most recent business days would be adequate. We also recommend that the old files that you do maintain be kept in a separate building from the current files.

Note: The external auditor views this change as relatively more critical than changes recommended in prior years.

Question 3. Assuming the change is implemented, how would you evaluate the strength of the file disaster recovery internal control procedure? (Please circle your response.)

Very Weak					<u>Adequate</u>				Very Strong
-4	-3	-2	-1	0	+1	+2	+3	+4	

C1P4s (2)

Question 4. Classify the recommended change. (Please refer to the definitions of desirable and undesirable on the cover sheet, and circle your response.)

- a. addition of a desirable control
- b. addition of an undesirable control
- c. deletion of a desirable control
- d. deletion of an undesirable control
- e. a simultaneous deletion of an undesirable control AND the addition of an undesirable control
- f. a simultaneous deletion of an undesirable control AND the addition of a desirable control

Question 5. In order for us to gauge the relative importance of factors that will influence your decision concerning the recommended change, please allocate 100 points to the following factors:

The source of the recommendation
(the external auditor) _____

The tone of the recommendation _____

Your own assessment of the economic cost-benefit
impact on your company from the change _____

Other factors (please specify below) _____

Total (must add to 100)

100 points

Other factors: _____

Question 6. If the recommended change were implemented, in your opinion how would the change affect the quality of the overall system of internal control? (Please circle your response.)

Greatly Reduce Internal Control					Internal Control Unaffected						Greatly Improve Internal Control
-4	-3	-2	-1	0	+1	+2	+3	+4			

Question 7. What would you communicate to the audit committee about the recommended change? (Please circle your response.)

Strongly Recommend Rejection									Strongly Recommend Acceptance
-4	-3	-2	-1	0	+1	+2	+3	+4	

APPENDIX C
ADDITIONAL QUESTIONS

The next two pages contain xerographically reduced copies of the additional questions that were the final two pages of the experimental instrument.

Thank you for your help so far. Please answer a few more questions.

1. In general, would you consider participating in another experiment if another researcher requests your assistance?
Please circle one: yes no

2. Please comment on the clarity of the internal control descriptions and the meaning of the questions that followed each description.

3. How confident are you of your responses?
Please circle one:
 - a. not too confident
 - b. fairly confident
 - c. very confident

4. Have you ever worked as a public accountant?
Please circle one: yes no

5. I have worked _____ years as an accountant or auditor.

6. Have you had any training in electronic data processing or computer related functions? If so, was your training formal or informal?

7. Please describe how familiar you are with the internal control procedures that occurred in the experiment.
8. Please check the position that most closely describes your job.
- ☐ entry level
 - ☐ senior level
 - ☐ manager
 - ☐ senior manager
 - ☐ assistant vice president
 - ☐ vice president
 - ☐ president
9. What is the employment position of the person to whom you report? Check one.
- ☐ senior level
 - ☐ manager
 - ☐ senior manager
 - ☐ assistant vice president
 - ☐ vice president
 - ☐ president
10. Some of the external auditor's recommendations were stronger than others. How important do you believe the strength of the recommendation was in influencing your judgment?
- | | | | | | | | | |
|------------------|----|----|----|---|----|----|----|------------------|
| Not | | | | | | | | Very |
| <u>Important</u> | | | | | | | | <u>Important</u> |
| -4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 |

APPENDIX D
EXPLANATION OF ADDITIONAL QUESTIONS

The following is a brief description of the additional questions which each subject answered after completing the four scenarios to which he was assigned. The two pages of the questionnaire associated with these descriptions are found in Appendix C.

Participate again. Subjects were asked to respond "yes" or "no" to the question: "In general, would you consider participating in another experiment if another researcher requested your assistance?"

Clarity. Subjects were asked an open-ended question about the clarity of the internal control questions and the meaning of the questions that they had been asked.

Confidence. Subjects were asked to rate their confidence in their own answers. They were given the following choices: "not too confident", "fairly confident", and "very confident".

Public accounting experience. Subjects were asked if they had ever worked as public accountants. Response options were "yes" or "no".

Experience. Subjects were asked the number of years that they had worked as accountants or as auditors.

Training. Subjects were asked an open-ended question about the amount of EDP training, formal and informal, that they had received.

Familiarity with controls. Subjects were asked an open-ended question about their familiarity with the controls discussed in the experiment.

Work level. Subjects were asked to provide information concerning their relative work positions. They were provided with a scale from entry level to president.

Reporting level. Subjects were asked to provide information concerning the position of their work supervisor. They were given a scale from senior level to president.

Impact of tone manipulation. Subjects were asked to rate the influence that the strength of the external authority's recommendation had on the subject's own decision to accept or reject the proposed change. They were asked to respond on a nine-point scale, which ranged from "not important" (-4) to "very important" (+4).

APPENDIX E PRE-TESTING

In developing the scenarios and questions, three pilot tests were administered. At the conclusion of the pilot testing, a field trial was run. As a result of the pilot testing and field trial, modifications were made to the experimental instrument and the experimental design.

The first pilot test was administered to an undergraduate auditing class. Four different corporate structures were used (pre-testing and revision reduced this to one corporate structure in the final instrument). The results of the pilot test led to: a reduction in the experimental design, a revision of the form of the experimental design, and a more careful examination of the content of the scenarios.

The second pilot test was designed to confirm the reasonableness of the experimenter's classification of the type of control manipulation in the scenarios. Subjects, Ph.D. students, were asked to read the scenarios and place them face down into piles according to how they classified the recommended changes. While there were four correct classifications, six options were given. Of the 84 responses,

thirty-three were misclassified. Some of the misclassified results were not logical. When asked to explain them, the subjects either described a misconception about internal controls, said they placed them in the wrong piles, or were just confused. These misclassifications were ignored. Each of the other misclassifications was investigated. In the case of multiple misclassifications, the scenarios were rewritten. After corrections were made, a second version of this pilot test was run using another Ph.D. student. Some weaknesses in the experimenter's classification of type of change were noted and a few revisions were necessary. A third version of the second pilot test was administered to another Ph.D. student who correctly classified all of the changes in the scenarios. The descriptions of the control procedures and the recommended changes were not changed after this point.

The third pilot test used undergraduate auditing students as subjects. Forty-four responses were obtained. The instrument and its form seemed acceptable, and it was decided to proceed with field testing.

The experiment was administered in a field test to the controller and internal auditing staff of a software manufacturing company. The firm's accounting records were fully computerized. In addition, because of the nature of the firm's product, the staff was predisposed to an understanding of the experimental task. However, several

weaknesses in the experimental design attracted attention when the data was examined. A second external authority (systems analyst) was added to provide a comparison for the source variable. In order to accommodate this change without increasing the size of the experiment, the second company was dropped from the design. Also, two more dependent variables were added. The result was the experimental instrument which is found in Appendices A, B, and C.

APPENDIX F
FORMULAS FOR PARTIAL CORRELATION COEFFICIENTS

Hays [1973, p. 711] gives the formulation for a partial correlation coefficient holding one variable constant.

$$r_{12.3} = \frac{r_{12} - (r_{13} r_{23})}{[(1-r_{13}^2)(1-r_{23}^2)]^{.5}}$$

Steel and Torrie [1960, p. 303] give the following formulation for partial correlation holding two variables constant.

$$r_{12.34} = \frac{r_{12.4} - (r_{13.4} r_{23.4})}{[(1-r_{13.4}^2)(1-r_{23.4}^2)]^{.5}}$$

Using the correlation coefficients in Table 5-20, and applying the formulas to the path model:

$$r_{ti.c} = \frac{r_{ti} - (r_{tc} r_{ic})}{[(1-r_{tc}^2)(1-r_{ic}^2)]^{.5}} = -.003$$

$$r_{ts.c} = \frac{r_{ts} - (r_{tc} r_{sc})}{[(1-r_{tc}^2)(1-r_{sc}^2)]^{.5}} = .027$$

$$r_{is,c} = \frac{r_{is} - (r_{ic} r_{sc})}{[(1-r_{ic}^2)(1-r_{sc}^2)]^{.5}} = .077$$

$$r_{ti,sc} = \frac{r_{ti,c} - (r_{ts,c} r_{is,c})}{[(1-r_{ts,c}^2)(1-r_{is,c}^2)]^{.5}} = -.005$$

$$r_{si,tc} = \frac{r_{si,c} - (r_{st,c} r_{it,c})}{[(1-r_{st,c}^2)(1-r_{it,c}^2)]^{.5}} = .077$$

BIBLIOGRAPHY

- Abdel-khalik, A. Rashad, and Ajinkya, Bipin B. (1979), Empirical Research in Accounting: A Methodological Viewpoint. Sarasota, Florida: American Accounting Association, 1979.
- Albrecht, W. Steve; Cherrington, David J.; Payne, I. Reed; Roe, Allan V.; and Romney, Marshall B. (1980), "Auditor Involvement in the Detection of Fraud," pp. 207-61. In Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Alderman, C. Wayne, and Deitrick, James W. (1981), "Internal Audit Impact of Financial Information Reliability." The Internal Auditor, XXXVIII No. 2 (April, 1981), 43-48.
- Allen, Brant (1977), "The Biggest Computer Frauds: Lessons for CPAs." The Journal of Accountancy, CXLIII (May, 1977), 52-62.
- American Institute of Certified Public Accountants (1975), Auditing Standards Executive Committee, "Related Party Transactions," Statement of Auditing Standards Number 6 (AICPA, 1975).
- _____. (1977a), Auditing Standards Executive Committee, "The Independent Auditor's Responsibility for the Detection of Errors or Irregularities," Statement of Auditing Standards Number 16 (AICPA, 1977).
- _____. (1977b), Auditing Standards Executive Committee, "Illegal Acts by Clients," Statement of Auditing Standards Number 17 (AICPA, 1977).
- _____. (1980), Auditing Standards Board, Statement on Auditing Standards No. 30- Reporting on Internal Accounting Control (AICPA, 1980).
- _____. (1982), AICPA Professional Standards as of June 1, 1982. Chicago: Commerce Clearing House, 1982.

- Asher, Herbert B. (1976), Causal Modeling. Beverly Hills: Sage Publications, 1976.
- Ashton, Robert H. (1974a), "An Experimental Study of Internal Control Judgments." Journal of Accounting Research, XII (Spring, 1974), 143-57.
- _____. (1974b), "Cue Utilization and Expert Judgments: A Comparison of Independent Auditors With Other Judges." Journal of Applied Psychology, LIX (August, 1974), 437-44.
- _____. (1979), "Comment: Some Observations on Auditors' Evaluations of Internal Accounting Controls." Journal of Accounting, Auditing and Finance, III (Fall, 1979), 56-66.
- _____ and Brown (1980), "Descriptive Modeling of Auditors' Internal Control Judgments: Replication and Extension." Journal of Accounting Research, XVIII (Spring, 1980), 269-77.
- _____ and Kramer, Sandra S. (1980), "Students as Surrogates in Behavioral Accounting Research: Some Evidence." Journal of Accounting Research, XVIII (Spring, 1980), 1-15.
- Bamber, Edward Michael. (1980), Expert Judgment in the Audit Team: An Examination of Source Credibility. Ann Arbor, Michigan: University Microfilms International, 1980.
- Barefield, Russell M. (1975), The Impact of Audit Frequency on the Quality of Internal Control. Sarasota, Florida: American Accounting Association, 1975.
- Baruch, Hurd. (1980), "The Audit Committee: A Guide for Directors." Harvard Business Review, LIX (May-June, 1980), 174-76, 180, 182, 186.
- Berton, Lee. (1981), "The Ins and Outs of Internal Control: A University of Florida Symposium." Journal of Accountancy, CLI (May, 1981), 28-32.
- Biggers, Thompson, and Pryor, Bert. (1982), "Attitude Change: A Function of Emotion-Eliciting Qualities of Environment." Personality and Social Psychology Bulletin, VIII (March, 1982), 94-99.

- Birnbaum, Michael H., and Stegner, Steven E. (1979), "Source Credibility in Social Judgment: Bias, Expertise, and the Judge's Point of View." Journal of Personality and Social Psychology, XXXVII (January, 1979), 48-74.
- Blalock, H. M., Jr. (1962), "Four-Variable Causal Models and Partial Correlations." American Journal of Sociology, LXVIII (September, 1962), 182-94.
- _____. (1971), Causal Models in Social Sciences. Chicago: Aldine-Atherton, Inc., 1971.
- Brown, Marilyn V. (1977), "Auditors and Internal Controls: An Analyst's View." The CPA Journal, (September, 1977), 27-31.
- Campbell, Donald T. and Stanley, Julian C. (1963), Experimental and Quasi-Experimental Designs for Research. Chicago: Rand McNally College Publishing Company, 1963.
- Clay, Raymond J., and Haskin, Daniel L. (1981), "Can Internal Auditors Reduce External Audit Costs?" The Internal Auditor, XXXVIII No. 2 (April, 1981), 62-69.
- Cressey, Donald R. (1980), "Management Fraud, Accounting Controls, and Criminological Theory." Management Fraud: Detection and Deterrence, pp. 117-47. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Cushing, Barry E. (1974), "A Mathematical Approach to the Analysis and Design of Internal Control Systems." The Accounting Review, XLIX (January, 1974), 24-41.
- DeMarco, Victor F. (1981), "The Triple Threat Against Fraud." The Internal Auditor, XXXVIII (August, 1981), 39-43.
- Elliott, Robert K. and Willingham, John J. (1980), Management Fraud: Detection and Deterrence. New York: Petrocelli Books, Inc., 1980.
- Fisher, Marguerite. (1978), "Internal Controls: Guidelines for Management Action." Journal of Accounting, Auditing and Finance, I (Summer, 1978), 349-60.

- Fletcher, John C. (1981), "In Search of the Elusive Definition of 'Internal Control'." The Internal Auditor, XXXVIII No. 3 (June, 1981), 39-45.
- Goldberg, Arthur S. (1966), "Discerning a Causal Pattern Among Data on Voting Behavior." In Causal Models in Social Sciences, pp. 33-48. Edited by H.M. Blalock. Chicago: Aldine-Atherton, Inc., 1971.
- Greller, Martin M. (1980), "Management Fraud: Its Social Psychology and Relation to Management Practices," pp. 171-84. Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Hass, R. Glen (1981), "Effects of Source Characteristics on Cognitive Responses and Persuasion." In Cognitive Responses in Persuasion, pp. 141-72. Edited by Richard E. Petty, Thomas M. Ostrom, and Timothy C. Brock. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc., 1981.
- Hays, William L. (1973), Statistics for the Social Sciences. New York: Holt, Rinehart and Winston, 1973.
- Heise, David R. (1975), Causal Analysis. New York: John Wiley & Sons, 1975.
- Hennigan, Karen M., Cook, Thomas D., and Gruder, Charles L. (1982), "Cognitive Tuning Set, Source Credibility, and the Temporal Persistence of Attitude Change." Journal of Personality and Social Psychology, XLII (March, 1982), 412-25.
- Hovland, Carl I., and Weiss, Walter (1952), "The Influence of Source Credibility on Communication Effectiveness." Public Opinion Quarterly, XV (Winter, 1951-1952), 635-50.
- The Institute of Internal Auditors, Inc., (1979), Standards for the Professional Practice of Internal Auditing. Altamonte Springs, Florida: The Institute of Internal Auditors, 1979.
- Jaccard, James (1981), "Toward Theories of Persuasion and Belief Change." Journal of Personality and Social Psychology, XL (February, 1981), 260-69.

Joyce, Edward J. (1976), "Expert Judgment in Audit Program Planning." Journal of Accounting Research, XIV (Supplement, 1976), 29-60.

_____. and Libby, Robert (1982), "Behavioral Studies of Audit Decision Making." Journal of Accounting Literature, I (Spring, 1982), 103-23.

Katz, Jack (1980), "Concerted Ignorance: The Social Psychology of Cover-up," pp. 149-69. In Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.

Kim, Jal-on, and Ferree, G. Donald (1981), "Standardization in Causal Analysis." Sociological Methods and Research, X (November, 1981), 187-211.

Lewis, Barry L. (1980), "Expert Judgment in Auditing: An Expected Utility Approach." Journal of Accounting Research, XVII (Autumn, 1980), 594-602.

Mautz, Robert K., and Neary, Robert D. (1979), "Corporate Audit Committee- Quo Vadis?" Journal of Accountancy, CXLVIII (October, 1979), 83-88.

Mautz, Robert K., and Neumann, Frederick L. (1977), Corporate Audit Committees: Policies and Practices. Altamonte Springs, Florida: Institute of Internal Auditors, 1977.

Neumann, Frederick L. (1980), "Corporate Audit Committee and Foreign Corrupt Practices Act." Business Horizons, XXIII (June, 1980), 62-71.

_____. (1981), "Corporate Audit Committee and Foreign Corrupt Practices Act." Journal of Accountancy, CLI (March, 1981), 78-80.

Orceyre, Michel J., and Courtney, Robert H., Jr. (1978). "Considerations in the Selection of Security Measures for Automatic Data Processing Systems." Computer Science & Technology. Edited by Gloria R. Bolotsky. Washington D.C.: U.S. Department of Commerce, 1978.

Palmer, Russell E. (1977), "Audit Committees- Are They Effective? An Auditor's View." Journal of Accountancy, CXLIV (September, 1977), 76-79.

- Parker, Donn B. (1980), "Computer-Related Management Misdeeds," pp. 185-93. In Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Pomeranz, Felix. (1977), "How the Audit Committee Should Work." Journal of Accounting, Auditing, and Finance, I (Fall, 1977), 45-52.
- Reckers, Philip M. J. and Taylor, Martin E. (1979), "Consistency in Auditors' Evaluations of Internal Accounting Controls." Journal of Accounting, Auditing and Finance, III (Fall, 1979), 42-55.
- Rittenberg, Larry E., and Davis, Gordon B. (1977), "The Roles of Internal and External Auditors in Auditing EDP Systems." Journal of Accountancy, CXLIV (December, 1977), 51-58.
- Rittenberg, Larry E., and Miner, Donald L. (1979), "Cost-Benefit Analysis of Internal Controls." University of Wisconsin Working Paper 8-79-16. Madison: Graduate School of Business (August, 1979).
- Ruder, Brian; Eason, Tom S.; See, Malin E.; and Russell, Susan H. (1977), Systems Auditability & Control Study Data Processing Audit Practices Report. Report to the Institute of Internal Auditors, Inc., Altamonte Springs, Florida, 1977.
- Russell, Susan H., Eason, Tom S., and Fitzgerald, J.M. (1977), Systems Auditability & Control Study Data Processing Control Practices Report. Report to The Institute of Internal Auditors, Inc., Altamonte Springs, Florida, 1977.
- Saunders, David R. (1980), "Psychological Perspectives on Management Fraud," pp. 107-15. In Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Schiff, Allen. (1979), "Should CPAs Serve on Audit Committees?" Journal of Accountancy, CXLVIII (November, 1979), 86-88.

- Schiff, Michael, Sorter, George H., and Wiesen, Jeremy L. (1977), "The Evolving Role of Corporate Audit Committees." Journal of Accounting, Auditing, and Finance, I (Fall, 1977), 19-44.
- Simon, Herbert A. (1954), "Spurious Correlation: A Causal Interpretation." Journal of American Statistical Association, XLIX (September, 1954), 467-79.
- Sorensen, James E., and Sorensen, Thomas L. (1980), "Detecting Management Fraud: Some Organizational Strategies for the Independent Auditor," pp. 195-206 In Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Steel, Robert G. D. and Torrie, James H. (1960), Principles and Procedures of Statistics. New York: McGraw-Hill Book Company, Inc. 1960.
- Thompson, William E. (1981), "You Are The Profession." The Internal Auditor, XXXVIII (August, 1981), 19-22.
- Turner, Jerry L. (1980), "Classifying Acts of Fraud," pp. 95-106. In Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Uecker, Wilfred C., Brief, Arthur P., and Kinney, William R. (1981), "Perception of the Internal and External Auditor as a Deterrent to Corporate Irregularities." The Accounting Review, LVI (July, 1981), 465-78.
- Uretsky, Myron. (1980), "An Interdisciplinary Approach to the Study of Management Fraud," pp. 89-93. In Management Fraud: Detection and Deterrence. Edited by Robert K. Elliott and John J. Willingham. New York: Petrocelli Books, Inc., 1980.
- Ward, D. Dewey, and Robertson, Jack C. (1980), "Can Independent Auditors Use More Extensively the Work of Their Internal Counterparts?" Journal of Accountancy, CL (October, 1980), 62-73.

- Weber, Ron (1978), "Auditor Decision Making on Overall Systems Reliability: Accuracy, Consensus, and the Usefulness of a Simulation Decision Aid." Journal of Accounting Research, XVI (Autumn, 1978), 368-88.
- _____. (1980), "Some Characteristics of the Free Recall of Computer Controls by EDP Auditors." Journal of Accounting Research, XVIII (Spring, 1980), 214-41.
- Williams, Harold M. (1977), "Audit Committees- The Public Sector's View." Journal of Accountancy, CXLIV (September, 1977), 71-74.
- Wright, Sewall (1960), "Path Coefficients and Path Regressions: Alternative or Complementary Concepts?" In Causal Models in Social Sciences. pp. 101-14, Edited by H.M. Blalock. Chicago: Aldine-Atherton, Inc., 1971.

BIOGRAPHICAL SKETCH

I was born on January 1, 1947, in Norfolk, Virginia. I attended Norfolk public schools, Fork Union Military Academy at Fork Union, Virginia, and Norfolk Academy until I dropped out in the tenth grade. I served in the United States Navy Reserve from 1966 until 1972.

I enrolled at Old Dominion University in September, 1971, as a part-time night student. After completing a B.S. in Accounting in December, 1974, I enrolled in the accounting Ph.D. program at the University of Florida in January, 1975. I joined the accounting faculty at Louisiana State University in January, 1983. I completed the requirements for the Ph.D. in December, 1983.

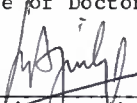
I was married to Barbara Hurwitz Friedberg in 1968. We have two daughters, Jennifer Robin Friedberg (born December 15, 1975) and Dori Susan Friedberg (born May 6, 1982).

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality as a dissertation for the degree of Doctor of Philosophy.




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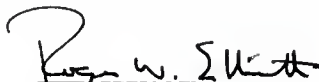
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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality as a dissertation for the degree of Doctor of Philosophy.

A handwritten signature in dark ink, appearing to read "Roger W. Elliott", is written over a horizontal line.

Roger Elliott
Professor of Computer and
Information Sciences

This dissertation was submitted to the Graduate Faculty of the School of Accounting in the College of Business Administration and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December, 1983

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